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Abstract

This paper analyses the effect of antidumping (AD) duties on the pricing behaviour of exporters targeted with these measures. Using product and firm-level data for South Korea, the study provides evidence of increased export unit values and firms' markups following the imposition of AD ad valorem duties. These findings are consistent with the hypothesis that, unlike other import tariffs, AD duties are not absorbed by exporters. The results on firms' average markups also suggest that the price adjustment following the imposition of AD duties occurs mostly through the export price, and not through reductions in the exporter's home price. The analysis controls for the presence of other trade measures as well as the endogeneity in AD and other contingent protection measures.

Keywords: Endogenous trade policy, Import tariffs, Ad valorem duties, Antidumping, Markup, Unit values, Contingent protection.

JEL Classifications: F13; D22; D43; L11.

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1 Introduction

The last few decades have witnessed an unprecedented reduction in traditional forms of import protection across the world. However, this process has been accompanied by the emergence of new forms of protection. In fact, the same GATT/WTO system that has provided the framework for the process of multilateral liberalisation, includes flexibilities allowing members to impose trade restrictions under particular circumstances, particularly through what are called contingent protection measures. It is argued that these flexibilities are meant to work as safety valves necessary to achieve further liberalisation. Yet, these instruments present institutional specificities, such as the conditions under which they may be applied or the way in which measures are calculated, that can have important consequences with respect to their effects on market outcomes. Understanding these effects is therefore essential to evaluate whether current instruments are appropriate.

This paper aims to contribute to the debate by focusing specifically on antidumping (AD) and its effects on the pricing behaviour of the exporters targeted by these measures.[1] AD is particularly interesting first because it is among one of the most intensively used forms of trade restrictions.[2] Also, since the early 1990s onwards, there has been a great rise in the number of countries using this tool. Emerging economies like China, India and Brazil, who did not have an AD law before or did not apply it, are today among AD's most intensive users (Rovegno and Vandenbussche 2011). Given the importance of AD as a trade instrument, it is therefore particularly relevant to understand its peculiarities and how they affect competition and market outcomes.

The interest in AD also stems from the specific way in which this measures are implemented. More particularly, AD restrictions are applied when foreign firms are found to sell their product in the export market at a price lower than normal value, where the latest is usually calculated as the price of its home sales.[3] Importantly, AD measures are calculated on the basis of the dumping margin - the difference between normal value and foreign firms' export prices (net of transport costs and other charges). This endogeneity in the calculation provides firms with incentives that greatly differ to those present in other forms of trade restrictions, particularly in what concerns firms' pricing behaviour.

Moreover, once AD measures are in place, they can be reviewed by request of interested parties. Usually these reviews involve recalculation of dumping margins on the basis of recent information on prices, and the consequent adjustment of duty levels. This presents foreign firms with an inter-temporal decision where prices today can affect the level of duties they will face tomorrow (Blonigen and Haynes 2010). At the same time, firms may have a static incentive to absorb duties, like they would do with any other transport cost or charge. Which of these two mechanisms will prevail in the trade-off becomes an empirical question. This is what this paper intends to explore.

There is a rich body of literature analysing the effects of AD on firms' behaviour. Papers such as Gruenspecht (1988) and Prusa (1994) show that the mere presence of an AD law can affect competition and market outcomes. Other studies, including Staiger

[1] Antidumping is regulated by GATT Article VI and the Agreement on Implementation of Article VI of GATT 1994, also known as the Anti-Dumping Agreement.

[2] For example, according to WTO notifications, between 1995 and 2010 a total of 2503 AD measures were imposed worldwide, while in the same period safeguards and countervailing (CV) duties accounted for only 101 and 158 measures, respectively.

[3] Additionally to the presence of dumping, there has to be evidence that this dumping is causing material injury to domestic producers.

and Wolak (1994) and Krupp and Pollard (1996), find that the different stages of AD investigation (filing of a petition, preliminary rulings by the authorities, terminations, etc.) also have effects on trade flows and prices. Additionally, Prusa (1992) and Zanardi (2004) show that AD can be used strategically by domestic firms in order to induce foreign firms into price arrangements. Yet, this literature mostly concerns the effects of AD filings prior to the imposition of measures. In this paper, I am interested in the effects of AD when measures have effectively been imposed.

The study uses data on worldwide AD petitions against South Korean firms between 1992 and 2009, coming from the World Bank's Temporary Trade Barriers Database (TTBD, Bown 2010). South Korea is a particularly interesting case since it is the most targeted country in the world after China. It is, in fact, targeted by a great variety of AD users, including traditional users like the European Union and the United States, as well as new users like China, India and Argentina. As such, AD activity against South Korea offers a good coverage in terms of countries and products. Additionally, South Korean firms have been targeted with AD measures at least since the 1980s. Therefore, exporters from this country should be familiar with AD rules, and provide a good example of the optimal response of firms to such measures. Finally, unlike China, South Korea has a consolidated market economy and is hence a good example for the study of the effects on firms' pricing behaviour.

I focus particularly on AD measures taking the form of ad valorem duties. As it will be shown later, the majority of AD measures against South Korea take this form. This is also the only type of measure that is used systematically across countries. Another nice feature of AD duties is that TTBD reports their level. Differences in duty levels across products and time are exploited in the empirical section to obtain identification of their effect on unit values and markups. Using UN Comtrade trade data at the 6-digit HS product level by destination, I first look at f.o.b. unit values and find that they increase with AD ad valorem duties (ADD). This suggests that South Korean exporters adjust their export prices in response to ADD imposed against them, probably in order to avoid or reduce further duties. The second part of the empirical analysis looks at the effects of ADD on firms' average markups. I use firm-level data on South Korean firms and estimate markups employing the methodology recently developed by De Loecker and Warzynski (2012). Results show an increase in firm-level markups when the sector in which the firm operates is facing ADD abroad. This provides further evidences supporting the non-absorption hypothesis. It also suggests that the price adjustment occurs through the export price, and not through reductions in the exporter's home price. I control for endogeneity in contingent protection measures and other regressors using instrumental variables.

The empirical literature on the effects of AD measures has mostly focused on the behaviour of the domestic firms protected by AD.[4] This paper contributes to the literature first by looking at the effects on foreign firms' targeted with these measures. To my knowledge, this is the first study to combine trade and firm-level data to analyse the effects of AD measures on targeted firms.[5] It also contributes to the literature on AD by providing evidence on the direction and type of price adjustment realized by firms targeted with these measures. Additionally, it contributes to literature on trade policy

[4]This includes Konings and Vandenbussche (2005, 2008), Pierce (2011), Rovegno (2013), among others. See Blonigen and Prusa (2003) for a review of earlier literature.

[5]Konings and Vandenbussche (2013) use similar data to analyse the effects on exporters' from the country imposing AD measures.

in general, by illustrating how the institutional specificities of trade policy instruments can have important implications regarding their effects on firms' behaviour and market outcomes.

This paper closely relates to the work of Blonigen and Park (2004) who study the pricing behaviour of exporters faced with AD measures in the United States. In their model, foreign firms have a static incentive to dump, leading to the imposition of AD duties which are adjusted through a review process. Under uncertain enforcement, their model predicts that the effect on export prices depends on foreign firms' ex-ante belief about the likelihood of AD measures. The authors test the predictions of the model by looking at changes in AD measures following administrative reviews. However, as will be argued in the next section, due to the way in which dumping is calculated in reviews, their results are not informative of what is happening to f.o.b. prices. Also related are the findings by Blonigen and Haynes (2002, 2010) for iron and steel imports from Canada targeted by AD measures in the United States. They estimate a pass-through of AD duties of about 60%, implying a decrease in f.o.b. export prices following the imposition of these measures. However, as the authors argue, this may not hold for other products and countries. Using data for a broader sample of products and destinations, in this paper I present evidence of increased f.o.b. prices for South Korean exports, suggesting the non-absorption of ADD. Finally, the findings presented in this paper also relate to previous studies analysing the effects of AD on trade flows. Surprisingly, most of this literature looks at the effects on imported values or quantities but not unit values. Exceptions are Prusa (1997) for the United States and Ganguli (2008) for India, who present descriptive analyses showing an increase in c.i.f. unit values following the imposition of AD measures. Also, Avsar (2013) finds a positive correlation between export unit values and AD duties imposed against Brazilian firms.

The paper is organized as follows. The next section discusses more in detail the relevant theory and mechanisms at play for understanding the effects of ADD on export prices. Section 3 describes the data used in the empirical analysis. Section 4 presents the evidence from export unit values, and section 5 is dedicated to the analysis of firms' markups. Finally, section 6 discusses the main conclusions and suggests areas for future research.

2 Antidumping duties and export prices

Dumping refers to a situation in which a foreign exporter sells its product in the export market at a lower price than in its own home market. From an economic point of view, dumping thus defined refers simply to price discrimination across borders. It would only require differences in market structures and demand between the two countries for this to occur. Moreover, even absent such differences, dumping may appear in the presence of transport costs. In fact, Brander and Krugman (1983), Weinstein (1992), and more recently Ottaviano et al. (2002) and Melitz and Ottaviano (2008) show how, under quite general assumptions, foreign firms do not pass-through all transport cost to final consumers, resulting in lower received prices abroad than at home, i.e. dumping. Therefore, the legal definition of dumping refers to a situation that should very frequently arise in international trade.

At first glance, one might be tempted to regard AD duties as analytically equivalent to an additional transport cost. In a context where firms find it optimal not to transfer

all transport costs to consumers, i.e. where dumping occurs, it would be expected that foreign firms absorb part of these duties and, therefore, decrease their received price. However, ADD are different to other import tariffs and transport costs. They are calculated on the basis of the dumping margin - the difference between export prices and normal value, usually defined as the price of home sales. Also, under current WTO regulations, AD measures are imposed for a maximum of five years, after which they have to be revised (sunset reviews). Moreover, interested parties can request earlier reviews, usually once measures have been in force for at least one year. Generally, these reviews would involve recalculation of dumping margins, and the consequent adjustment of duty levels on the basis of the latest information on prices. As such, reviews allow foreign firms to influence the level of future duties through their pricing behaviour.[6]

To better illustrate this mechanism it is useful to present some definitions. Let P_t be the price paid by consumers in the export market at time t, and let T be transport costs and other charges that for simplicity are assumed to be ad valorem. The foreign firm's received price net of these costs is then given by P_t/T. Additionally, let P_t^{NV} be normal value, then in the case of a review, the ADD for the next period will be calculated as follows:

$$\tau_{t+1} = \frac{P_t^{NV}}{P_t/T} \tag{1}$$

where $\tau_{t+1} = (1 + ADD_{t+1})$ is the tariff factor of ADD in the next period. This equation illustrates how foreign firms can affect the future level of duties by changing their prices in period t.

A priori, this adjustment could take place either through P_t^{NV} or P_t. However, previous literature has argued that most of the adjustment to AD measures takes place through the export price (Blonigen and Park 2004, Gallaway et al. 1999, Pauwels et al. 2001). This is due primarily to the discretion authorities have regarding the method used to calculate normal value. If the competent authority considers that home and export prices are not comparable, they can apply instead a constructed measure of normal value.[7] This is usually a hypothetical price calculated on the basis of information on firms' costs and a given profit rate. Alternatively, they may also use as benchmark the price of exports to a third market. In these circumstances, changing the home price would have no effect on the level of duties.[8] The empirical analysis presented in the next sections will provide evidence that supports the hypothesis that most of the adjustment comes through the export price, and not the price of home sales. With this in mind, in the remainder of this section I will follow the literature and focus on the adjustment through the export price.

Blonigen and Park (2004) present a dynamic pricing model that formalizes the price

[6]Unfortunately, data on reviews of AD measures are difficult to come by. An exception is Nita and Zanardi (2013) who provide information for AD reviews in the European Union. For the 15 measures against South Korea imposed in the European Union in the period of study, their database contains information on reviews for 6 of them, of which half resulted in reductions in duties for at least one of the firms involved.

[7]This may be due to specific characteristics of each market like their degree of regulation, size or because the country of origin of these firms is not considered a market economy.

[8]Some AD laws present additional features that can render adjustment through the home price even less effective. For example, EU AD law includes an anti-absorption provision which allows ADD to be increased if export prices are found to decrease once ADD are in place (Vermulst and Ikenson 2007). In this context, even if firms adjust their home price to eliminate dumping, they may still face higher duties if their export price drops.

adjustment mechanism facing firms targeted with AD. They abstract from the possibility of adjustments through normal value by assuming it exogenously given. In their model, foreign firms have a static incentive to dump in that, absent AD measures, the export price that maximises their current profits is less than normal value. This leads to the imposition of AD duties which are adjusted through a review process of infinitive horizon.[9]

In the first period, the period of investigation, no duties are in place, but the pricing behaviour of the foreign firms determines the outcome of the AD case and the measures to be imposed from the second period onwards. They introduce uncertainty in the outcome of the original AD investigation, which can result in an affirmative ruling leading to duties, a negative ruling or a formal or informal agreement between parties - a voluntary export restraint (VER) in their model. The probability of each outcome is assumed to be an industry level characteristic and exogenous to the specific firm. Therefore, firms only control their dumping margin but not the probability of an affirmative ruling if they dump. This investigation period is followed by an infinitive number of periods where no other AD cases are initiated. In each period, ADD are reviewed for the next period on the basis of current prices as in equation (1).[10]

The model assumes perfect enforcement during the review process, meaning that during reviews duties are set exactly at the level of dumping margin with no uncertainty. Yet, the presence of uncertainty in the original investigation has important consequences regarding the behaviour of firms facing reviews. The way in which foreign firms adapt their pricing behaviour depends crucially on their ex-ante beliefs about the likelihood of AD measures. Firms that are surprised by ADD, that is, those that get an ADD but have a low ex-ante expectation of such an outcome, react by increasing their export price in order to reduce future duties. Also, firms that have a high probability of a VER, also increase their export price if targeted with ADD instead. Contrarily, firms that considered the probability of ADD to be high and dumped anyway (resulting in ADD), are those that discount the future enough and, hence, do not adjust export prices to influence the level of future duties.

Using data on ADD revisions in the United States, they present empirical evidence supporting the predictions of the model. They do not observe prices directly, but infer price changes through the observed adjustments in AD measures. However, Blonigen and Park's results are not entirely informative of what is happening to foreign firms' f.o.b. prices. This is due to the way in which ADD are calculated during the review process. Once ADD are in place, the foreign firm's f.o.b. price, that is the price it receives for its exports net of transport costs and charges including ADD, is given by:

$$P_t^{f.o.b.} = \frac{P_t}{T\tau_t} \tag{2}$$

[9]They do not consider strategic interaction in the model. They consider a foreign firm facing a firm specific demand function, assuming implicitly monopolistic competition.

[10]It should be pointed out that this rule of ADD review does not reflect one important feature of AD law in the United States. When products affected by ADD enter the US market, the importer pays a cash deposit calculated on the basis of the dumping margin set by the investigation's final decision or at the last review. However, the actual amount to be paid may be adjusted through subsequent reviews. This makes duties retroactive, and hence, gives greater incentive to increase export prices in the current period. This retroactivity is a peculiarity of US AD law and is not present in other system like that of the European Union, for example. Blonigen and Park do not introduce retro-activeness in their model, making it closer to the EU system. However, they report that the introduction of retro-activeness into the model provides qualitatively the same results - see the working paper version Blonigen and Park (2001, footnote 8).

As Kelly (2010) and Blonigen and Haynes (2010) argue, during reviews ADD are not discounted from the export price when calculating dumping margins, i.e. new ADD are calculated on the basis of P_t/T and not $P_t^{f.o.b.}$. Therefore, the duty adjustments found by Blonigen and Park (2004) correspond to situations where firms adapt P_t/T to reduce duties but are not necessarily increasing their f.o.b. prices. In fact, as Kelly (2010) points out, it would suffice to maintain f.o.b. prices in order to avoid further duties.

However, there are other features of AD that may lead firms to increase prices further and potentially result in increased f.o.b. prices. An important assumption in Blonigen and Park's model is that there is no uncertainty in review process. The reason for this is that most of the uncertainty associated with AD outcomes, particularly in the United States during their period of study, is related to the injury decision in the initial case, while during administrative reviews only dumping margins were usually reviewed but not injury. This is no longer true under the post-Uruguay Round AD system. During sunset reviews, continuing injury or threat of injury must be found in order for measures to be renewed. Additionally, earlier reviews may also involve assessment of the presence of injury.[11]

Additionally, AD reviews generally involve not only looking at the evolution of export prices but also recalculation of normal value.[12] This implies that firms face some degree of uncertainty regarding the normal value that will be used in reviews. If firms do not know exactly the benchmark to which their exports prices will be compared to, they may overcompensate by increasing export prices beyond normal value currently calculated.

Another reason, also linked to the calculation of dumping margins, is the use of zeroing (Blonigen and Haynes 2010). This practice consists in replacing negative dumping margins found in specific transactions with zeros. There are basically two types of zeroing, "model" and "transaction" zeroing (Vermulst and Ikenson 2007). The first applies when separate dumping margins are calculated for different models of the product under investigation, while the second refers to different transactions within the same model.[13] This practice implies that transactions where dumping margins are negative cannot be used to compensate those where dumping is positive. Therefore, foreign firms cannot avoid further duties by not dumping on average, they need to avoid dumping on a transaction basis, which should normally result in higher average prices.

Also important is the role of foreign firms not named in the original AD investigation. AD filings are carried out against specific firms from the exporting countries who are suspected of dumping. However, once ADD are imposed, all exporters from the targeted country, named or not in the investigation, are liable to pay a duty. For not named firms, these ADD are calculated on the basis of the firm-specific duties imposed to named firms.[14] However, AD regulations usually provide opportunities for not named firms, particularly new exporters, to request firm-specific reviews of dumping and duties. As a

[11]For example, out of the 63 firm-specific reviews for South Korean exporters included in the EU dataset by Nita and Zanardi (2013), 33 involved the revision of the injury decision.

[12]I thank Edwin Vermulst for confirming this information.

[13]Not all users use both types of zeroing. For example, following a WTO dispute between the European Union and India regarding a bed linen case, the European Union has ceased to apply "model" zeroing. It continues, nonetheless, to apply "transaction" zeroing (Vermulst and Ikenson 2007; Vermulst and Prusa 2009). The United States still used both types of zeroing throughout the sample period and until March 2012.

[14]The level of these "all-other-firm" duties differs among AD users. For example, under US AD law it is calculated as the weighted-average of ADD imposed to named firms, while in the European Union is the maximum level of duties imposed.

consequence, these exporters also have an incentive to increase their export prices above normal value in order to potentially obtain reductions in the duties they have to pay.

Finally, ADD may also affect observed f.o.b. prices through its effects on quality. Considering a market with vertical product differentiation, an increase in transport cost (or duties) may result in increasing shares in exports for high quality varieties. A mechanisms behind this effect is the Alchian and Allen (1964) conjecture which states that unit transport cost increase the relative demand for higher quality varieties. However, since ADD considered in this study are ad valorem, the Alichan-Allen effect should not apply. This is because ad valorem duties - unlike unit transport costs - impact the export price of all qualities proportionally, and therefore do not result in increased relative demand for higher quality varieties (Hummels and Skiba 2004).

Nonetheless, AD measures may affect the composition of exports through firm selection. This is because ADD could impose a price floor (normal value) in the market forcing low-quality (low-price) exporters to exit. However, under AD law, firms can obtain firm-specific duties on the basis of their firm-specific price differentials. More precisely, when dumping margins are calculated for each firm, its export price is compared to a firm-specific normal value (Blonigen 2006). It would be expected that a low-quality firm sell a cheaper good not only in the export market but also at home. Low quality firms should then be allowed to export at a lower price than a high quality firm, since the benchmark to which their export price is compared to is also lower. If that is the case, then no selection effect should take place.

Even in the absence of composition effects, duties may also affect export quality through within-firm quality choices. A rich body of literature has studied this phenomena and shown that under imperfect competition both tariffs and quotas may affect the quality choices of firms. However, although the sign of the effects depends crucially on the type of protection and market structure, tariffs unlike quotas generally lead exporters to decrease the quality of their product (Das and Donnenfeld 1987, Krishna 1987, Herguera et al. 2002).

Regarding specifically the case of AD, the only paper to my knowledge that addresses this issue is Vandenbussche and Wauthy (2001). They present a two-stage Bertrand duopoly with vertical differentiation and study the effects of AD price undertakings on the quality choice of firms.[15] They find that, in the long run, these measures can lead to quality reversals where foreign exporters produce the high-quality good, while domestic firms produce the low-quality variety. This is due to the restriction on price competition imposed by the price undertaking, which increases competition in quality pushing foreign firms to offer a higher quality good. However, their result depends crucially on the assumption that the price undertaking will fix a price such that the foreign firms matches the price of the domestic firm.[16] Also, in light of the diverse effects found in the literature regarding different forms of trade barriers, it is not clear whether this result would also hold for ad valorem duties. Crucially, unlike the case of price undertakings where foreign firms receive the whole price, when duties are imposed instead, firms receive the price net of the duty. Therefore, upgrading quality may not be necessarily optimal for foreign

[15] A price undertaking is an arrangement where the foreign exporter agrees to raise its export price in order to avoid paying an AD duty.

[16] This is the case where the price is fixed so as to eliminate the injury margin, and is particularly relevant for AD systems which apply a lesser duty rule, like that of the European Union for example. However, if the dumping margin is lower, foreign firms would not be required to match the domestic firm's price and quality reversals would not necessarily occur.

firms facing ADD.

In view of these results, although quality effects cannot be completely ruled out, it is unlikely that the price effects found in this study are driven by increased export quality.

3 Data

This section presents an overview of the data and data sources used in the empirical analysis. A more comprehensive description is presented in appendix B.

The information on AD cases used in this study comes from the World Bank's Temporary Trade Barriers Database (TTBD, Bown 2010). It contains data on contingent protection petitions for more than 40 countries in a standard format allowing the aggregation of information across users. In particular, it includes the 26 countries which, according to WTO notifications, have targeted South Korea in the last two decades. This study considers all AD petitions initiated against South Korean firms between 1992 and 2009 involving manufacturing products.[17]

A summary of these petitions is presented in table 1. The first two columns show the number of AD initiations and measures disaggregated by imposing country. At the top of the list is India, the world's heaviest user of AD, followed by the United States, the European Union and China. In this regard, South Korea is not special among targeted countries since these jurisdictions are among the world's more intensive users of AD (Rovegno and Vandenbussche 2011). Also, as shown in the remaining four columns of the table, the majority of AD measures against South Korea take the form of ad valorem duties. It is also the only type of measure used systematically across countries. The preference for ad valorem duties is also a feature common to AD use worldwide and is not specific of AD cases against South Korea.[18]

Another nice feature of ADD is that TTBD includes information on the level of duties applied against firms not named in the AD filings. As was explained in section 2, even if not named in the investigation, all foreign exporters from the targeted country are liable to pay an AD duty. These "all-other-firms" duties are calculated on the basis of the firm-specific duties payable by named firms. They usually correspond to a trade-weighted duty or the maximum duty imposed to named firms (Rovegno and Vandenbussche 2012), and therefore provide a good approximation of the average level of AD protection in place.[19]

F.o.b. unit values are calculated using export data from UN Comtrade for 1994 to 2009 disaggregated by product and destination.[20] These data are matched with information

[17]The reason for focusing on manufacturing products is two folded. Firstly, the vast majority of AD cases and measures against South Korea concern manufacturing products, as it is the case for AD activity worldwide. In fact, according to members' notifications to the WTO, of the 4011 cases initiated worldwide between 1995 and 2011, 95% concerned manufacturing goods, while only 2 and 3% pertained to mineral and agricultural products, respectively. Additionally, the technique applied for the estimation of firm-level markups has been developed with manufacturing firms in mind. Therefore, its application to firms in other sectors may not be valid.

[18]Although the analysis focuses on ad valorem duties, product-country pairs where other type of measures or not measures at all are imposed are also included in the analysis and controlled for.

[19]Some AD filings do not report a unique "all-other-firms" duty but the range of ADD applied to firms named in the petition. For these cases, I used the simple average of the minimum and maximum duties reported. I verified that results hold when using the maximum level of duties instead.

[20]Exports to new EU Member States are dropped in order to avoid artificial jumps in the level of ADD due to countries' accession. However, they are necessarily reintroduced in section 5 in order to calculate AD exposure at the sector level. Yet, it should be noted that the shares of these countries on South Korean exports are very small and hence their inclusion does not change the sector level measure of AD

on AD petitions using the HS codes reported in TTBD. The resulting dataset includes 148 6-digit HS products affected by contingent protection filings against South Korea in the period of study. These include all product-country pairs concerned by cases, and not only those affected by ad valorem duties. The data set also includes exports in those products to destinations other than the ones concerned by the investigations.

Although AD cases frequently report 8 or 10-digit HS codes, the analysis is carried out at the 6-digit HS level since it is the maximum level of disaggregation comparable across countries. However, AD filings usually include several codes within the same 6-digit HS, and therefore, disaggregation at 6-digits seems adequate. Still, the higher level of aggregation implies a downward bias in the estimated effects, which could hide higher effects at the more disaggregated level. I will return to this issue in section 4.2.

I use data on destination's GDP, GDP per capita and effective exchange rate coming from the World Bank; a measure of distance between countries coming from the Centre d'Études prospectives et d'informations internationals (CEPII); and UN Trains ad valorem tariffs also defined at the 6-digit HS level.

The second part of the empirical analysis uses firm-level data coming from the commercially available database ORIANA (Bureau Van Dijk) version 2009. It contains a panel of balance sheet information on South Korean firms classified under the 5-digit Korean Standard Industry Classification (KSIC) Revision 9. Although the database starts in 1998, it has good coverage only for the period 2001 to 2008. Using a concordance table provided by the Korean Statistical Division to match KSIC sectors with AD cases and trade data, I construct sector level indicators of AD exposure which are matched with the firm-level data. The resulting dataset includes 3336 firms operating in 39 manufacturing 5-digit KSIC industries affected by contingent protection petitions. Additional industry-level data was obtained from the Mining and Manufacturing Survey provided by the Korean Statistical Department.

4 Evidence from export unit values

4.1 Methodology

In order to evaluate the effect of ADD on export unit values, I estimate the following specification:

$$log(UV_{jdt}) = \beta log(1 + ADD_{jdt}) + \alpha_{jt} + X_{jdt}\delta + Z_{dt}\varphi + u_{jdt} \tag{3}$$

UV_{jdt} is the unit value of South Korean exports of product j to destination d in year t, calculated as the ratio between export value and quantity. ADD_{jdt} is the level of AD ad valorem duties in place against South Korea in destination d for product j. Following what is standard in the literature, equation (3) uses the tariff factor of ADD to avoid the loss of observations with zero duties when applying logarithms (Blonigen and Haynes 2002, Nordås 2004). α_{jt} is a product-time fixed effect which accounts for all unobservables that make prices change across products and time (Iacovone and Javorcik 2010). In particular, the inclusion of these fixed effects controls for changes in world prices as well as all industry-level and macro shocks.

X_{jdt} represents a set of other product-destination controls. It first contains controls for other trade measures in place, including a dummy for AD measures of forms other

exposure significantly.

than ad valorem duties, and the log of the tariff factor of UN Trains ad valorem tariffs to account for the normal level of import protection. Other AD measures are expected to have a positive effect on unit values as ADD, while the opposite is true for measures other than AD since they can be absorbed by exporters. Controls also include the log of the tariff factor of countervailing duties (CVD).[21] Since CVD are not calculated on the basis of pricing differentials, firms can absorb CVD without affecting the level of future duties.[22] For this reason, the coefficient on this variable is expected to be negative. The specification also includes dummies for AD and CV initiations. These control for the fact that the initiation of an AD or CV investigation may push firms to adapt their prices in order to affect rulings (Staiger and Wolak 1994).[23] Finally, I include the share of South Korean exports on d's imports calculated at the 2-digit HS level as a proxy for South Korea's market power in the export market.[24] It would be expected that more market power should translate in higher export prices. However, this would not be true if that higher export share is capturing a comparative advantage also associated with lower export prices.

Z_{dt} is a set of destination-specific controls. These include, first, the log of CEPII's weighted distance measure from South Korea to destination d to control for additional transport costs associated to geographical distance (Mayer and Zignago 2011). It also accounts for the Alchian and Allen (1964) effect, which implies that firms sell higher quality goods to more distant destinations. Since these two effects impact on f.o.b. unit values in opposite directions, the expected sign of this variable is a priori ambiguous. I also include the log of country d's GDP and GDP per capita. The inclusion of GDP is based on the idea that larger markets attract more competition, therefore resulting in lower prices.[25] GDP per capita controls for the fact that higher purchasing power is associated with the consumption of higher quality goods.

Finally, I include the log of the effective exchange rate of destination d obtained from the IMF's International Financial Statistics. This is an index that measures the variation in the value of the country's currency with respect to a weighted average of other country's currencies divided by a price deflator. An increase in the effective exchange rate implies that the country has become relatively more expensive. So it measures how competitive in terms of its exchange rate destination d is. Changes in the effective exchange rate imply, in the short run, changes in relative prices expressed in different currencies, affecting the price received by firms for their exports. Note that changes in South Korean effective exchange rate are accounted for through the product-time fixed effects.[26]

[21] CVD are another form of contingent protection measure similar to AD except that they apply to cases where the foreign government is suspected of subsidising its exporters.

[22] See, for example, European Union (1998).

[23] Although CVD are not calculated on the basis of price differentials, they may still present "filing effects" on prices. During the investigation process, along with evidence of subsidising, domestic firms must show that this is causing them injury. Therefore, CV investigations may also have effects on prices if foreign firms decide to restrict their exports or increase their prices in order to affect the injury ruling.

[24] This variable is calculated at a higher degree of aggregation due to some inconsistencies across countries in UN Comtrade data. For several product lines South Korean export data do not match destinations' import data, which introduces noise in the variable at 4 and 6-digit HS. This is much less of a problem at the 6-digit level. Although this variable is calculated at a higher degree of aggregation, potential endogeneity may be a concern. I run alternative specifications instrumenting for this variable using its lags and results were not affected.

[25] For example, see Melitz and Ottaviano (2008).

[26] See appendix B.1 for a more detailed description of the variables used in the analysis on export unit values.

In conclusion, conditional on a large set of regressors, equation (3) identifies the effect of ADD on f.o.b. unit values through the differences in the timing and level of duties across destinations and products. These differences make the identification of the effect possible without the need to use a constructed control group using matching techniques.[27] Moreover, the dataset also includes observations for exports of affected goods to destinations where no duties have been imposed, therefore exploiting also the differences in unit values between AD and non-AD destinations within products. Additionally, it includes export of products involved in cases resulting in other type of measures or where no measures where imposed. In summary, equation (3) can be viewed as a difference-in-difference specification where the timing and intensity of the treatment differs across the treated, and where these other two groups of products work as a counterfactuals also helping identify the effect of ADD.

4.2 Results

Basic specification

The results of estimating equation (3) are presented in table 2. Columns 1 and 2 show the basic specification excluding and including country fixed effects respectively.[28] The variable of interest, $log(1 + ADD_{jdt})$, presents a positive and significant coefficient, implying that ADD are associated with higher f.o.b. unit values. However, the magnitude of the effect is not directly interpretable given the non-linear relationship between ADD and unit values implied by equation (3). As an illustration, let us imagine that starting from zero tariffs, an ADD of 10% is imposed. The coefficient estimated in column 1, for example, implies an increase of approximately 2.88% in f.o.b. unit values. If we consider instead the imposition of an ADD equal to the average level of duties (conditional on ADD being in place), 26.31%, then the estimated effect is approximately a 7.5% increase in unit values.[29]

Regarding results for control variables, note that CVD present a negative coefficient, although it is not significant when country fixed effects are included. As discussed in the previous section, this is expected given that these measures are not calculated on the basis of price differentials like ADD and should usually be associated with lower unit values. AD and CV initiation dummies are not significant. This is probably due to the fact that investigations last for a few months before duties are imposed, making it difficult to pick up any effects using yearly data.[30] The dummy on other AD measures presents a negative coefficient, which is the opposite of what would be expected. However, these results should be taken with caution since they are driven by a reduced number of products and destinations. The estimated coefficient may be capturing other unobserved specificities of these particular export destinations or their AD systems.

Also, the log of UN trains presents a positive and significant coefficient, which is surprising since ad valorem costs are usually associated with lower f.o.b. prices (Hummels

[27] I thank Simon Evenett for pointing this out.

[28] Basic results are also robust to including product-country fixed effects

[29] The magnitude of these estimates should not be taken literally. As discussed above, the trade data used to calculate unit values is aggregated at 6-digit HS, while AD measures are usually imposed at the 8 or 10-digit level. Therefore, the reported estimates may be hiding effects of higher magnitude at the more disaggregated level. Yet, given that the level of aggregation implies a downward bias in the estimated effect, the overall conclusion of a positive effect on unit values holds.

[30] Note that ADD includes both preliminary and final duties.

and Skiba 2004). However, it should be pointed out that these tariffs present little variability in time limiting the ability of capturing any adjustment to changes in the degree of protection. Also, these coefficients could be capturing lower degree of competition in these markets due to higher overall protection against imports.[31] The share of South Korea in destination's imports presents a negative effect, probably capturing competitive advantages by South Korea leading both to lower prices and higher market shares in specific markets. The log of distance also presents a negative coefficient reflecting the absorption of transport costs. The logs of GDP per capita and GDP are both significant and present the expected signs. Finally, the real effective exchange rate presents a negative coefficient which could be due to an incomplete pass-through of exchange rate differences to final consumers.[32]

The remaining columns of table 2 present some extensions to the basic results discussed above.[33] First, column (3) presents the separation of ADD between preliminary and final duties.[34] The coefficient of final duties is positive and significant, and somewhat larger than before, while that of preliminary duties is insignificant. This shows that previous results are driven by final duties and hence its interpretation unaltered.[35]

Column (4) test for the presence of a non-linear effect by introducing the square of $log(1 + ADD_{jdt})$. The interaction presents a negative coefficient and is significant, suggesting that the effect becomes smaller for lager values of ADD, as would be expected. The estimated average elasticity of unit values to ADD is now of 0.6855, and is positive for duty levels below 49.8%. Only 37 observations among the data points used in the estimation exceed this level of duties, while for the other 793 observations where duties are in place the effect is still positive. It should be noted, however, that the square becomes insignificant if destination or product-destination fixed effects are introduced.

[31] In fact, if product-country fixed effects are introduced, the coefficient of these two variables becomes insignificant suggesting the estimating effects are capturing cross-sectional differences among destinations.

[32] The exchange rate variable is missing for 52 destinations of the original dataset, and hence, its inclusion in the model implies some loss of observations. To verify how this affects results, equation (3) was estimated dropping this variable and including the entire dataset, obtaining very similar results.

[33] Unless otherwise indicated, all results are robust to the inclusion of destination and product-destination fixed effects.

[34] AD investigations are usually carried out in two stages. After a first stage of investigation, preliminary duties may be imposed pending the final decision. These stay in place during the second phase of the proceedings until a final decision is taken and, if affirmative, final measures are imposed.

[35] The non-significance of the coefficient of preliminary duties should not be interpreted as the absence of any effect. Preliminary duties are usually in place only for a few months, which makes the identification of their effects difficult using annual data. Dale (1980) and Staiger and Wolak (1994) discuss several reasons why the imposition of preliminary duties may have an effect on prices. Firstly, under some AD systems, like the United States' for example, if both preliminary and final decisions are positive, the actual amount of duties paid during the investigation period is calculated after the final decision retroactively on the basis of prices effectively charged during that period. Therefore, foreign exporters, that have received an affirmative preliminary ruling and expect also an affirmative final ruling, can reduce the level of duties effectively paid by increasing their prices. Another possibility is that the filing of the AD case may dampen price competition in a situation where price wars would have emerged otherwise. Particularly, if foreign firm were to reduce their prices during the investigation period, this may increase the probability of an affirmative injury decision. The reason is that in the evaluation of material injury, authorities usually look at how much the foreign firms undercut domestic ones. This is particularly explicit in AD systems which apply a "lesser duty rule", like in the European Union, but it is also considered in other systems like the United States' (Staiger and Wolak 1994). Additionally, authorities usually use new information that comes available during the investigation period, and therefore, price cuts during this period could increase the probability of an injury decision and hence of AD measures.

The next column looks for the presence of an average effect of ADD by introducing a dummy indicating their presence. Earlier literature on AD has frequently analysed its effects using dummies rather than duty levels, and hence, it is interesting to see whether such an average effect is found. The coefficient of the dummy is positive but not significant. At the same time, it makes the coefficient of the log of ADD insignificant as well - although they are jointly significant. Also, if product-destinations fixed effects are introduced (not reported here) the coefficient of the average effect is still insignificant, but that of the log of ADD becomes significant again and of higher magnitude. A similar result is found if additionally to the average effect dummy, the square of the log of ADD is also introduced. These results suggest that there does not seem to be an effect on unit values for the mere presence of AD duties, but its effect depends on the level of the duties.

Finally, the estimation in column (5) checks whether the effect of ADD depends on the degree of product differentiation. If products are highly differentiated, exporters should have more room to adjust their prices in the face of ADD, and therefore, we should expect larger price effects. To test this, the variable of interest $log(1 + ADD_{jdt})$ is interacted with a measure of the elasticity of product substitution coming from Broda and Weinstein (2006).[36] As expected, the interaction presents a negative coefficient which implies a smaller effect for higher elasticity (less product differentiations), however the coefficient is not significant.[37]

Controlling for endogeneity

A concern in the estimation of equation (3) is the potential endogeneity of contingent protection measures. The sign of this endogeneity bias is a priori ambiguous. For example, if there was a negative demand shock in the market of a given product, this would push down the price in that market. Simultaneously, this could lead domestic firms in a given country d to request contingent protection, while at the same time make it more likely that they will get it. In fact, if the price of the product in country d is decreasing relative to normal value, this would increase the probability of a positive dumping margin. Additionally, the downturn in the industry's performance, would also make an affirmative injury decision more likely. In this case, equation (3) could be underestimating the magnitude of β.

At the same time, applying for import protection is costly. Lawyer need to be hired and information needs to be gathered in order to present a compelling case to the authorities. Coordination among domestic producers is also required, since a given level of support by the domestic industry is necessary for the case to be considered. The ability of firms to overcome coordination and other costs associated to filing is clearly linked to the structure of the market. Usually coordination will be easier in more concentrated markets (Bombardini 2008), resulting both in higher prices and a more intensive AD and CV activity. In this case, equation (3) would be overestimating the impact of ADD on unit values.

The regressors included in the estimations presented above already control, at least partially, for these effects. Regarding the first source of endogeneity, the inclusion of

[36]Note that it is not necessary to also introduce the elasticity of substitution by itself since it is controlled for by the product-year fixed effects.

[37]The introduction of the elasticity of substitution to the analysis implies a small loss of observations (2%). However, the results reported so far are almost identical if estimations are cared out with this reduced sample.

product-year fixed effects controls for worldwide demand or other shocks at the level of the product or industry. At the same time, GDP and GDP per capita control for business cycle changes at the country level. However, these controls do not account for all potential sources of endogeneity, particularly if there are heterogeneous shocks at the country - product level.[38] For this reason, I next estimate an instrumental variable (IV) specification where AD and CV measures are endogenised and instrumented for.

The strategy used to instrument them is based on information on the past behaviour of AD and CV variables. The idea is that policy decision taken in the past are based on the set of information available to authorities at that point in time, and therefore they should not be correlated to the current error term. At the same time, given that the current level of AD and CV activity is in part determined by what has happened in the previous year, these instruments should be strongly correlated to the endogenous variables and therefore, provide strong instruments. More specifically, the instruments include the one-period lags of all endogenous regressors as well as the number of past AD and CV measures. I also include the one-period lag of the growth rate of South Korean exports to destination d. Inclusion of the last instruments rest on the idea that a rise in exports would increase the likelihood of being targeted with contingent protection measures.

Regarding safeguard measures, unlike AD and CV, they are applied at the MFN level and are not related specifically to the trade relationship between South Korea and the destination concerned. However, the sources of bias discussed above are clearly also present. I experimented instrumenting also for the dummy on safeguard measures and, although the qualitative conclusions regarding AD were not affected, this instrumentation affected the magnitude of the estimated effects. Given that safeguards are rather infrequent in the dataset (they are present only for 66 observations), I chose to drop these observations and only instrument for AD and CV variables. However, all results presented above hold for the reduced sample.

Table 3 presents the IV estimation for the main specifications presented in table 2. The first stages of the IV specification are presented in appendix D.1. All the main conclusions discussed above hold. However, the magnitude of the effects is larger, suggesting a downward bias in the non-IV estimation. Also, some of the coefficients on control variables are no longer significant, most notably that of CVD.

5 Evidence from firms' markups

The previous section presented evidence showing that f.o.b. unit values increase with the imposition of ADD, which provides support to the hypothesis of non-absorption of these duties. This section explores how this translates in terms of firms' markups.

It is important to clarify at the outset that the firm-level data used in this analysis does not contain separate information on domestic and export sales. Therefore, what it is observed is firms' average markups calculated on the basis of its total sales regardless of their destination. Firms' average markups also aggregate across the different goods produced by the firm.[39] The analysis presented below uses a constructed index of AD ex-

[38]The inclusion of product-country fixed effects to a certain extent for the different degree of concentration. This is of course provided that the level of concentration has not varied substantially during the estimation period, something that is unlikely given the length of the panel.

[39]It should be noted that, even if information of sales by product and market where available, information on costs would still be aggregated at the firm level making it impossible to estimate a product

posure which partially overcomes this problem, at least at the industry level, by weighting each measure using the share of the export directly affected by the AD case (by product and destination) on all exports of the sector.

Still, looking at firms' average markups is informative on how firms are reacting in the presence of AD. As was discussed in section 2, in theory firms could influence dumping margin calculations not only by increasing their export price but also by decreasing their home price. However, previous literature has argued that adjusting home price is not always a realistic option for foreign firms. Firstly, authorities may decide to use a constructed normal value or the price in a third country rather than the home price, in which case, increasing the home price to avoid duties would be futile. Additionally, Korean firms may be less willing to carry out this type of adjustment if their home market matters more for them (the average industry export intensity in the sample is 25%).

Changes in firms' average markups can give us important information regarding the type of price adjustment carried out by Korean firms in the face of AD measures. This is because the two types of adjustments should reflect differently on firms' average markups. If the majority of the adjustment comes through the export price, we should observe markups going up. Conversely, if firms instead decrease their home price, then average markups should decrease as well. The empirical evidence presented in this section provides evidence that average firms' markups increase in the presence of ADD, giving support to the hypothesis that the majority of the adjustment comes through the export price.

5.1 Methodology

Estimation of markups

Markups are estimated using the methodology developed by De Loecker and Warzynski (2012, henceforth DLW), which presents many advantages with respect to other commonly used estimators. For example, a method frequently used in the literature is to calculate markups as observable price-cost margins (PCM). This consists on approximating the Lerner index by $(PQ - P_M M - WL)/PQ$, where PQ are sales, $P_M M$ are material costs and WL are labour costs. The problem with this method is that it does not allow separating price and productivity effects. This is important for the purposes of my analysis, since I am interested in changes in markups resulting from price adjustment and not productivity shocks. There are other estimators, widely used in the literature, that also allow for this separation. Particularly popular are the methods by Hall (1988) and Roeger (1995). However, these techniques estimate markups as a coefficient in a regression and therefore, provide an estimate of the average markup across a sector or group of firms. DWL in contrast provides a separate estimation of the markup for each observation. This allows variation in markups through time and across firms giving more flexibility to the estimation. Additionally, Hall (1988) and Roeger (1995) present endogeneity problems that are difficult to tackle with a short panel like the one used here.[40]

The next paragraphs present an overview of the method, additional details are provided in Appendix C. The starting point is a gross-output production function of the form:

or market specific markup.

[40]For example, Konings and Vandenbussche (2005) deal with endogeneity in Roeger's method by estimating a dynamic equation using Arellano and Bond's (1991) GMM estimator.

$$Q_{it} = A_{it}F(M_{it}, L_{it}, K_{it}) \tag{4}$$

where Q_{it} is firm i's output at time t, A_{it} is an unobserved Hicks-neutral productivity term and M_{it}, L_{it} and K_{it} are materials, labour and capital respectively. Assuming no adjustment costs in input X, first order conditions for cost minimization imply:

$$\mu_{it}^X \equiv \frac{P_{it}}{C_{it}} = \frac{\theta_{it}^X}{\alpha_{it}^X} \tag{5}$$

where C_{it} is marginal cost, $\theta_{it}^X \equiv \frac{\partial F(M_{it},L_{it},K_{it})}{\partial X_{it}}$ is the output elasticity of input X, and $\alpha_{it}^X \equiv \frac{P_{Xit}X_{it}}{P_{it}Q_{it}}$ is its expenditure share. The latter is observable, while output elasticity is obtained by estimating the production function. In the case of this study, markups are obtained on the basis of the output elasticity and expenditure share of materials. This choice is based on the likely presence of adjustments costs in labour which makes it an unsuitable measure for markups. Following DWL, output elasticities are obtained on the basis of a gross-output trans-log production function of the form:

$$y_{it} = \beta_m m_{it} + \beta_l l_{it} + \beta_k k_{it} + \beta_{mm} m_{it}^2 + \beta_{ll} l_{it}^2 + \beta_{kk} k_{it}^2 + \beta_{lm} l_{it} m_{it} + \beta_{km} k_{it} m_{it} + ... \\ ... + \beta_{kl} k_{it} l_{it} + \omega_{it} + \epsilon_{it} \tag{6}$$

where $y_{it} = log(Q_{it})$, $\omega_{it} = log(A_{it})$, and other lower case letters indicate logarithms of the corresponding uppercase variables. ϵ_{it} is the error term. The advantage of using a trans-log production function is that it allows for variations in output elasticities across firms and time. Using a constant-output-elasticity production function, such as Cobb-Douglass, would imply that all the variation observed in markups is due to changes in the expenditure share. Moreover, it could bias the results on the impact of AD in markups since potential technology variation would be attributed to variation in markups (DLW).

The main challenge in the application of this method is to correctly estimate equation (6). Given the potential sensitivity of the results to this issue, I estimate the production function using four alternative methods: OLS, fixed effects (FE), Levinsohn and Petrin (2003, henceforth LP) and Ackerberg et al. (2006, henceforth ACF). For LP and ACF, I applied Wooldridge's (2009) IV procedure as presented in Ornaghi and Van Beveren (2011).

The estimated output elasticity of materials is given by:

$$\hat{\theta}_{it}^M = \hat{\beta}_m + 2\hat{\beta}_{mm} m_{it} + \hat{\beta}_{lm} l_{it} + \hat{\beta}_{km} k_{it} \tag{7}$$

Expenditures shares α_{it}^M are a priori observable. However, output directly observed from the data is actually $\tilde{Q}_{it} = Q_{it} exp(\epsilon_{it})$ and, therefore, an additional adjustment is required. Following DLW, I adjust expenditure shares using the residuals $\hat{\epsilon}_{it}$ obtained from the estimation of equation (6), as follows:

$$\hat{\alpha}_{it}^M = \frac{P_{Mit} M_{it}}{P_{it}(\tilde{Q}_{it}/exp\,(\hat{\epsilon}_{it}))} \tag{8}$$

Using the estimation of output elasticities and adjusted expenditure shares of materials, the markup of a firm i operating in sector s at time t is calculated as $\hat{\mu}_{ist} = \hat{\theta}_{ist}^M / \hat{\alpha}_{ist}^M$.

Estimated specification

Using firm-level markups thus obtained, the effects of ADD are estimated on the basis of the following specification:

$$log(\hat{\mu}_{ist}) = \beta log(1 + ADD_{st}) + \alpha_i + \gamma_t + X_{ist}\delta + Z_{st}\varphi + v_{ist} \quad (9)$$

ADD_{st} is a measure of sector-level exposure to ADD in exporting markets. It is constructed as the export-weighted average of all ADD in place in sector s at time t. Sectors are defined at the 5-digit KSIC level. Weights are given by the share of exports directly affected by ADD (product and destination) in total exports of the sector. In order to ensure that these weights are not affected by current AD petitions and measures, shares are calculated using export values lagged 2 to 4 periods. The equation also includes firm fixed effect, α_i, and a complete set of year dummies, γ_t, which capture all macroeconomic shocks.

Firm-level controls are given by X_{ist}, which include the logs of capital intensity (capital/sales ratio) and labour intensity (labour costs/sales ratio). It is expected that more capital intensive firms present higher fixed costs, and therefore, higher markups. These variables are clearly endogenous and are instrumented for using lags. Since instrumenting with lags in a fixed-effects estimation would provide bias estimates, equation (9) is estimated in first difference using the two-period lags of endogenous variables as instruments.[41]

Z_{st} is a set of industry controls. Firstly, it contains information on other AD, CV and safeguard measures. In particular, it includes ADD imposed by South Korea against imports from abroad since there is some overlap between targeted and protected sectors.[42] Other industry-level controls include import penetration, export intensity, the logarithm of the number of plants, the logarithm of industry observable markup,[43] and GDP growth calculated as the percentage change in industry value added. It would be expected that import penetration is associated with lower markups since it implies a heavier degree of foreign competition in the sector. A priori, export intensity should also be associated to greater exposure to competition and therefore lower mark-ups. Nonetheless, a higher degree of export intensity may also be associated with greater concentration and higher mark-ups. The number of plants and industry observable markups are introduced to proxy for the level of concentration in the industry. A more concentrated sector should present a more reduced number of plants as well as higher industry-level and firm-level markups. Therefore, I expect to find a negative correlation between the number of plants

[41]The within estimator regresses $(y_{it} - \bar{y}_i)$ on $(w_{i,t} - \bar{w}_i)$ with an error term given by $(e_{it} - \bar{e}_i)$. If the endogenous variable $w_{i,t}$ is correlated with $e_{i,t}$, then $w_{i,t-1}$ is correlated with $e_{i,t-1}$ and therefore, also with $\bar{e}_i$. This means that all lags of the endogenous variable are correlated with the current error term (Cameron and Trivedi 2005, p.764). This is particularly problematic in this study due to the short time span of the panel. The first difference estimator, on the other hand, regresses $(y_{it} - y_{i,t-1})$ on $(w_{i,t} - w_{i,t-1})$, with an error term given by $(e_{it} - e_{i,t-1})$. Clearly, the first lag of the endogenous variable w cannot be used as an instrument since it is correlated with $e_{i,t-1}$. However, $w_{i,t-2}$, even if correlated with $e_{i,t-2}$, should not be correlated with the current error in first difference. This is the same reasoning behind Arellano and Bond's (1991) estimator for dynamic panels.

[42]South Korea does not use CVD and did not impose safeguards in the period of analysis for the sectors considered.

[43]Industry observable markups are defined as $\mu = 1/(1 - PCM)$, where PCM are price-cost margins as defined above in the main text. If PCM is an approximation of the Lerner index $(p - c)/p$, then the observable industry markup is an approximation of markups defined as p/c. I use this transformation for coherence with the dependent variable.

and firms' markups and a positive correlation with industry markups. Industry GDP growth is introduced to control for the cyclicality (or counter-cyclicality) of markups. I also include the growth rate of regional manufacturing GDP for the region where the firm is located. Note that South Korea's and world GDP are controlled for through year dummies.

Finally, I also control for the regular levels of import protection using the log of UN Trains ad valorem tariff factor, both against South Korean exports abroad as well as tariffs imposed by South Korea on imports to the country. Like ADD, all other trade measures are trade-weighted.

Standard errors are clustered at industry level given that the variable of interest, $log(1 + ADD_{st})$, is defined at this level of aggregation. Results are robust to clustering at the firm level and bootstrapping.

5.2 Results

Basic specification

Table 4 presents the results of estimating equation (9). For brevity, the table shows estimations for markups obtained from the LP and ACF estimations of the production function. The results for OLS and FE mimic does of LP. In all specifications the coefficient of $log(1 + ADD_{st})$ is positive and significant and of similar magnitude. The estimates imply that starting from a situation with no duties, the imposition of a trade-weighted ADD equivalent to 10% is associated with an increase in average firms' markups of about 4 or 5%.

Also interesting is the result regarding ADD imposed by South Korea against imports. Consistently to previous literature (Konings and Vandenbussche 2005, Rovegno 2013, Pierce 2011), ADD protection is associated with an increase in markups for domestic firms. CVD also present a positive but insignificant coefficient. Safeguard measures presents a negative and significant coefficient (except for the ACF specification), suggesting absorption of duties as it would be expected. With the exception of capital intensity in the ACF specification, all other controls present insignificant coefficients.[44]

Following what was done in the analysis on export unit values, the remaining columns explore some extensions to the basic result. The specification in columns (3) and (4) separate ADD into preliminary and final duties. These results mirror what was found for export unit values. The coefficient on final measures is significant and of larger magnitude than that of all ADD, while the coefficient of preliminary duties is not significant.

The next specification tests for the presence of non-linearities by adding the square of $log(1+ADD_{st})$. As columns (5) and (6) report, the coefficient of the square is not significant, and its introduction makes the coefficient on the level also insignificant (although they are jointly significant, except for ACF). These results, therefore, do not support the presence of non-linearities. This also is coherent with the results on unit values when destination or country-destination fixed effects are introduced.

Finally, estimations in columns (7) and (8) test for the presence of an average effect by introducing a dummy indicating the presence of ADD. The coefficient of the dummy is not significant, while that of $log(1 + ADD_{st})$ remains positive and significant (except

[44]It should be noted that some of these control variables are significant if standard errors are clustered at the firm level and bootstrapped. These results are available from the author on request.

for the ACF specification). Therefore, as in the case of unit values, there does not seem to be an effect associated with the mere presence of ADD.

Controlling for endogeneity

The results presented above were obtained considering industry controls as exogenous. It may be argued that industry-level variables should not be subject to endogeneity in a firm-level estimation, given the different level of aggregation. However, this may not hold if markets are concentrated and some firms are large enough to influence industry level indicators. Firm's average market share in the database (calculated using operating turnover from Oriana) is rather low, 1.5%, but it presents a maximum of 86%. Therefore, at least for some firms, endogeneity of industry controls is a concern.

To address this issue, I estimate an alternative IV specification where sector-level variables are instrumented for. These include not only variables on industry performance but also trade measures imposed by South Korea, since these measures may have resulted from petitions and lobbying by South Korean firms. For now, I do not instrument for trade measures targeted at South Korean exports abroad, I will come back to this later.

As instruments, I use the two-period lag of each endogenous variable. I also add additional instruments to better predict trade policy measures. These were chosen on the basis of previous literature on the determinants of contingent protection measures (Hansen 1990; Hansen and Prusa 1996 and 1997; Baldwin and Steagall 1994; Sabry 2000; Knetter and Prusa 2003; and Blonigen and Park 2004; among others). Note that many of the variables put forward by the literature as determinants of trade measures, such as import penetration, are already included as regressors. To these, I add three additional measures of industry performance. Firstly, I include the log of the number of workers since it is more likely that policy makers will provide trade protection for sectors where employment is larger (Moore 1992, Hansen and Prusa 1996 and 1997). Additionally, I consider the growth rate of imports given that more competitive pressures from imports may push firms to seek protection. Finally, I introduce the growth rate of exports. Earlier literature has shown that exports can affect AD activity either through its impact on competition on the export market (Furusawa and Prusa 1996) or through fears of retaliation (Blonigen 2000, Blonigen and Bown 2003). As with other instruments, I use the two-period lags of these variables.

I also introduce instruments related to past AD and CV activity. In particular, I consider the number of past AD measures imposed in the sector by South Korean authorities. This accounts for the fact, frequently reported in the literature, that AD cases tend to occur repeatedly in the same sectors. Also, if firms in a given sector have successfully obtained import protection through AD, it is likely that they will try it again in the future. Finally, I include the number of AD and CV measures against South Korea since measures currently imposed by South Korea may be the result of retaliation.

The first four columns of table 5 show the results of this IV estimation. The corresponding first stages are presented in appendix D.2. As before, I only present the results for the LP and ACF markups since the OLS and FE are very similar to the LP. After instrumenting, industry controls are still insignificant. Moreover, variables measuring AD activity by South Korea also become insignificant. As for the variable of interest, $log(1 + ADD_{st})$, the estimated effect is still positive and significant in almost all specifications but more than two times larger than before. For ACF markups, the coefficient is not significant, but becomes significant if preliminary and final duties are separated

as presented in column (4). In conclusion, instrumentation of industry control variables does not seem to affect the main conclusions of the analysis.

Until now I have treated contingent trade measures against South Korea as exogenous. First, it should be noted that the endogeneity concerns discuss in section 4 regarding the unit value estimation do not really apply here. The problem there was that each observation represented a particular trade flow between South Korea and a given destination, so market conditions of that particular destination in the specific product could affect results. Now, trade measures are aggregated across destinations. Therefore, they represent average conditions facing South Korean firms in the world market rather than in a specific destination. Also, they are aggregated at the sector level, and do not represent a specific firms' exposure to trade measures. Provided macro and industry conditions are controlled for appropriately, these variables should not be subject to endogeneity concerns.

However, since AD measures and other contingent protection tools are imposed against specific trading partners, they may be the result of the behaviour of particular firms in the export markets in question. If these firms are large enough, and most importantly are also large exporters, endogeneity may still be a concern. With this in mind, I estimate an alternative IV specification where I endogenise these variables as well. The great amount of variables to be instrumented for in the analysis (almost all regressors in the equation), presents a challenge regarding the efficiency of the IV estimator. In order to improve efficiency and reduce the noise associated with so many instruments, I perform this IV estimation dropping from the sample sectors affected by AD filings by South Korea. These leaves 27 industries affected by AD filings abroad but that did not receive protection by South Korea during the sample period. Results presented so far hold for this reduced sample.

As before, I use the two-period lags of endogenous variables as instruments. To instrument for targeted measures, I also include the number of past AD and CV measures against South Korea, the rate of growth of exports, since it is more likely to be targeted with measures if exports are expanding, as well as the level of past average protection in export markets (log of UN trains ad valorem tariff factor). AD activity by South Korea is not included since sectors involved have been dropped.

Results are shown in the last four columns of table 5. The corresponding first stages are presented in appendix D.2. The estimated effect of targeted ADD is three times larger than before, suggesting that endogeneity introduced a downward bias in the estimation. Its coefficient is significant in all specifications except for ACF markups. However, as before, once preliminary and final duties are separated, the effect becomes significant. Also, other AD measures, which presented an insignificant coefficient before, have now a positive and significant effect, coherent with what has been found for duties. Nevertheless, they do not mirror what was found for export unit values making the interpretation of this result difficult. Still, regarding the conclusions on the impact of targeted ADD on markups, although there is an important difference in the magnitude of the effect, the main conclusions hold. Targeted ADD measures are associated with increased firm-level markups.

6 Conclusions

This paper analysed how antidumping ad valorem duties (ADD) affect the pricing behaviour of foreign firms targeted by them. Using information on antidumping (AD) measures against South Korea and trade data at the product level, it presents evidence that the imposition of ADD is associated with increases in f.o.b. export unit values. This suggests that, unlike what would be expected for traditional forms of import tariffs, firms do not absorb ADD. This result is likely to be attributable to the particular way in which ADD are calculated, where duties depend on past price differentials, given foreign firms' incentives to raise their prices in order to avoid or reduce future duties.

The second part of the analysis studied the effects on South Korean firms' markups estimated using firm-level data. Firms' average markups are also found to increase with ADD. This result is informative of the type of adjustment firms tend to carry out when faced with these measures. In theory, firms could affect the calculation of the dumping margin either by increasing their export prices or by decreasing their home price. The finding that average firms' markups increase with ADD provides evidence in support of the hypothesis that most of the price adjustment comes through the export price.

In sum, this study has provided empirical evidence regarding the direction and type of price adjustment carried out by firms targeted with AD measures. However, alternative adjustment mechanisms are possible and represent an important and potentially fruitful arena for future research. Firstly, the evidence presented in this paper is consistent with changes in quality of targeted exports, either through quality upgrading or firm selection, which would also result in higher export unit values and markups. Another possible strategy is export shifting. When firms are faced with ADD in one market, they may re-direct some of their exports towards other markets increasing competition in these other destinations, normally resulting in lower export prices. [45]

Firms may also react by changing the product mix of their exports. When the market of one product is closed due to the imposition of trade measures, foreign exporters may react by substituting sales of targeted products with sales in other goods, resulting in more competition in the markets of these products. On the other hand, firms may perceive AD measures as a signal of protectionist tendencies, and choose to increase prices or restrict sales in related products in order to avoid the risk of AD measures in those goods as well (Vandenbussche and Zanardi (2010) present evidence that points in this direction). This should result in less competition not only in the product directly affected by the measures but also in the markets of these other goods.

Finally, the empirical analysis presented in this paper considered the effects of AD on the pricing behaviour of all firms affected by measures. However, among these there are firms which are named in AD cases, and hence receive firm specific duties, while firms not named in the filing from the same country pay a country-wide AD duty. The incentives presented for both types of firms may differ greatly. In particular, named firms have already been identified in the case, and therefore know that their pricing behaviour

[45] Bown and Crowley (2006) study this phenomenon using data on Japanese exports and find that unit values of Japanese exports to the European Union decrease with AD measures imposed by the United States. This is consistent with the results presented here, since they imply higher relative export unit values to the AD imposing country with respect to other destinations. Note that the specification in equation (3) identifies the effect of ADD on unit values through differences across destinations. Therefore, the estimated effect is capturing changes in the relative price of exports across destinations. However, given that also firm-level markups are found to increase, it is unlikely that the effect on export unit values found here is driven by export shifting.

will determine the level of future duties in case of a revision. Other firms, on the other hand, have the choice between doing nothing and treating AD duties like any other type of tariff (exogenous to their behaviour), or coming forward and asking for a firm specific dumping calculation. The study of the different reactions of firms named and not named in AD investigations constitutes also an important issue to explore in future research.

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A Appendix: Tables

Table 1: Antidumping cases against South Korea, 1992 - 2009.

Imposing country	Number of initiations	Number of measures	Type of measure			
			AVD[a]	SD[b]	PU[c]	Other[d]
India	44	37	-	81%	-	19%
USA	42	19	100%	-	-	-
European Union	33	15	80%	-	13%	7%
China	32	26	92%	-	4%	4%
Australia	31	13	8%	-	-	92%
Taiwan	15	6	-	83%	17%	-
South Africa	14	13	38%	8%	-	54%
Indonesia	12	5	80%	-	-	20%
Argentina	11	7	29%	-	-	71%
Canada	11	7	100%	-	-	-
Mexico	9	2	100%	-	-	-
Turkey	8	7	71%	14%	-	14%
Pakistan	7	6	67%	-	-	33%
Malaysia	7	5	100%	-	-	-
New Zealand	7	3	100%	-	-	-
Brazil	6	2	100%	-	-	-
Thailand	5	3	-	-	-	100%
Egypt	4	4	-	25%	-	75%
Chile	3	0	-	-	-	-
Colombia	3	0	-	-	-	-
Philippines	2	1	-	-	-	100%
Peru	2	0	-	-	-	-
Japan	1	1	-	-	-	100%
Israel	1	0	-	-	-	-
Ukraine	1	1	-	-	-	100%
Venezuela	1	0	-	-	-	-

Notes: [a] Ad valorem duties (taxes specified as a percentage of the value of imports). [b] Specific duties (taxes specified as a money amount per unit of imports). [c] Price undertakings (agreements where the foreign exporter commits to raise its export price in order to avoid paying a duty). [d] Includes measures combining duties and price undertakings or cases where the type of measure is not reported.

Table 2: Effects of Antidumping duties on export unit values, basic specification.

Dependent variable: *Log of f.o.b. unit value*	(1)	(2)	(3)	(4)	(5)	(6)
Log ADD tariff factor	0.2878**	0.1798*		0.7064***	0.1343	0.4446***
	(0.1158)	(0.1062)		(0.2160)	(0.1540)	(0.1682)
Log preliminary ADD tariff factor			-0.1444			
			(0.2885)			
Log final ADD tariff factor			0.3283***			
			(0.1215)			
Log ADD tariff factor squared				-0.8743***		
				(0.2724)		
Average effect (dummy)					0.0540	
					(0.0405)	
Log ADD t.f. * elasticity of substitution[a]						-2.4408
						(1.6762)
Other AD measures (dummy)	-0.1004***	-0.0970**	-0.1009***	-0.1001***	-0.1004***	-0.0996***
	(0.0382)	(0.0414)	(0.0382)	(0.0382)	(0.0382)	(0.0386)
AD initiations (dummy)	0.0680	0.0294	0.0771*	0.0701*	0.0682	0.0732*
	(0.0417)	(0.0384)	(0.0416)	(0.0414)	(0.0417)	(0.0420)
Log CVD tariff factor	-3.7778**	-2.3870	-3.7070*	-5.0564**	-4.6855**	-3.2937*
	(1.9200)	(1.8670)	(1.9833)	(2.0346)	(1.9894)	(1.8714)
CVD initiations (dummy)	-0.0912	-0.0721	-0.0968	-0.0853	-0.0935	-0.0986
	(0.1522)	(0.1506)	(0.1525)	(0.1524)	(0.1518)	(0.1520)
Safeguard measures (dummy)	-0.0230	-0.0728	-0.0229	-0.0279	-0.0249	-0.0256
	(0.0723)	(0.0750)	(0.0718)	(0.0709)	(0.0726)	(0.0712)
Log UN Trains tariff factor	0.1814***	0.2660***	0.1810***	0.1840***	0.1831***	0.1573***
	(0.0564)	(0.0682)	(0.0564)	(0.0564)	(0.0565)	(0.0566)
Share of S. Korea in destination's imports[b]	-0.8107***	-0.5559***	-0.8107***	-0.8109***	-0.8114***	-0.8054***
	(0.0633)	(0.0648)	(0.0633)	(0.0633)	(0.0633)	(0.0636)
Log distance	-0.0146**		-0.0147**	-0.0150**	-0.0149**	-0.0111*
	(0.0065)		(0.0065)	(0.0065)	(0.0065)	(0.0066)
Log destination's GDP per capita	0.0610***	0.1033	0.0610***	0.0612***	0.0612***	0.0609***
	(0.0043)	(0.1404)	(0.0043)	(0.0043)	(0.0043)	(0.0044)
Log destination's GDP	-0.0113***	-0.1288	-0.0113***	-0.0116***	-0.0116***	-0.0123***
	(0.0031)	(0.1442)	(0.0031)	(0.0031)	(0.0031)	(0.0031)
Log real effective exchange rate	-0.0578*	0.0101	-0.0581*	-0.0576*	-0.0582*	-0.0469
	(0.0298)	(0.0368)	(0.0298)	(0.0298)	(0.0298)	(0.0300)
Observations	30,148	30,148	30,148	30,148	30,148	29,475
Number of product-year fixed effects	1,894	1,894	1,894	1,894	1,894	1,863
Number of destination fixed effects	-	71	-	-	-	-

Notes: Standard errors clustered by product and year in parentheses. ***/**/* denotes statistically different from zero at 1/5/10% levels respectively. [a] Elasticity of substitution from Broda and Weinstein (2006). [b] Calculated at the 2-digit HS level.

Table 3: Effects of Antidumping duties on export unit values, instrumental variables estimations.

Dependent variable: *Log of f.o.b. unit value*	(1)	(2)	(3)	(4)	(5)
Log ADD tariff factor	0.4024**	0.4170**		0.9002**	0.4672**
	(0.1955)	(0.1911)		(0.4251)	(0.1948)
Log preliminary ADD tariff factor			2.2712		
			(1.8068)		
Log final ADD tariff factor			0.5031**		
			(0.2020)		
Log ADD tariff factor squared				-1.0408**	
				(0.4961)	
Log ADD t. f. * elasticity of substitution[a]					-0.3401
					(2.7155)
Other AD measures (dummy)	-0.1180*	-0.0808	-0.0801	-0.1220*	-0.1022
	(0.0642)	(0.0807)	(0.0751)	(0.0653)	(0.0664)
AD initiations (dummy)	1.7711	4.0935	6.2080	0.8905	3.1476
	(4.3210)	(3.4440)	(6.0694)	(4.2418)	(4.4219)
Log CVD tariff factor	-3.7419	-2.9775	-3.2197	-3.6805	-3.8753
	(4.1928)	(8.6407)	(5.0026)	(4.4764)	(4.2232)
CVD initiations (dummy)	5.1562	-3.6765	-7.1746	22.3628	-1.8776
	(30.4715)	(36.1343)	(41.1941)	(32.0368)	(32.3104)
Log UN Trains tariff factor	0.2210**	0.3009***	0.2980**	0.2282**	0.2201**
	(0.0982)	(0.0960)	(0.1398)	(0.1083)	(0.1100)
Share of S. Korea in destination's imports[b]	-0.7270**	-0.6584	-0.8004*	-0.5468	-0.7791**
	(0.3222)	(0.5625)	(0.4193)	(0.3356)	(0.3442)
Log distance	-0.0266		-0.0331	-0.0402	-0.0223
	(0.0286)		(0.0342)	(0.0364)	(0.0312)
Log destination's GDP per capita	0.0623***	0.3787	0.0613***	0.0654***	0.0614***
	(0.0070)	(0.3038)	(0.0088)	(0.0074)	(0.0075)
Log destination's GDP	-0.0192	-0.4808	-0.0252	-0.0270	-0.0205
	(0.0170)	(0.4333)	(0.0204)	(0.0217)	(0.0187)
Log real effective exchange rate	-0.0569	0.0201	-0.0069	-0.0929	-0.0270
	(0.0767)	(0.0446)	(0.1108)	(0.0773)	(0.0802)
Observations	30,082	30,082	30,082	30,082	29,409
Number of product-year fixed effects	1,894	1,894	1,894	1,894	1,863
Number of destination fixed effects	-	71	-	-	-
Hansen test (p-value)	0.523	0.249	0.689	0.637	0.349

Notes: Standard errors clustered by product and year in parentheses. ***/**/* denotes statistically different from zero at 1/5/10% levels respectively. Endogenous regressors: log ADD tariff factor, log preliminary ADD tariff factor, log final ADD tariff factor, other AD measures (dummy), AD initiations (dummy), log CVD tariff factor, CV initiations (dummy). Excluded instruments: one-period lags of all endogenous regressors, the rate growth of export values, the number of past AD measures, and the number of past CVD. All estimations include product-year fixed effects.

[a] Elasticity of substitution from Broda and Weinstein (2006). [b] Calculated at the 2-digit HS level.

Table 4: Effects of Antidumping duties on firms' average markups, basic specification.

Dependent variable:	(1) $log(\hat{\mu}_{OLS})$	(2) $log(\hat{\mu}_{FE})$	(3) $log(\hat{\mu}_{LP})$	(4) $log(\hat{\mu}_{ACF})$	(5) $log(\hat{\mu}_{LP})$	(6) $log(\hat{\mu}_{ACF})$	(7) $log(\hat{\mu}_{LP})$	(8) $log(\hat{\mu}_{ACF})$
AD against South Korea								
Log ADD tariff factor	0.0491**	0.0407*			0.0374	0.0082	0.0437**	0.0374
	(0.0216)	(0.0244)			(0.0703)	(0.0740)	(0.0215)	(0.0248)
Log preliminary ADD tariff factor			0.0175	0.0064				
			(0.0206)	(0.0204)				
Log final ADD tariff factor			0.0713**	0.0649**				
			(0.0290)	(0.0302)				
Log ADD tariff factor squared					0.0067	0.0186		
					(0.0383)	(0.0416)		
Average effect (dummy)							0.0130	0.0080
							(0.0204)	(0.0189)
Other AD measures	1.3818	2.2728	1.1674	2.0355	1.3235	2.1101	1.5980	2.4059
	(1.1301)	(1.4862)	(1.0949)	(1.3758)	(1.2033)	(1.5336)	(1.1288)	(1.5378)
AD initiations	-0.1968	-0.3401*	0.0383	-0.0843	-0.2140	-0.3881	-0.1994	-0.3418*
	(0.1389)	(0.1843)	(0.0927)	(0.0720)	(0.2161)	(0.2769)	(0.1370)	(0.1829)
AD imposed by South Korea								
Log ADD tariff factor	0.0257***	0.0268***	0.0259***	0.0269***	0.0254***	0.0259***	0.0256***	0.0267***
	(0.0083)	(0.0079)	(0.0084)	(0.0079)	(0.0080)	(0.0070)	(0.0084)	(0.0079)
Other AD measures	0.0936	0.1283	0.1058	0.1412	0.0867	0.1091	0.1020	0.1335
	(0.2822)	(0.1668)	(0.3036)	(0.1661)	(0.2717)	(0.1717)	(0.2850)	(0.1674)
AD initiations	-0.1515***	-0.1292***	-0.1533***	-0.1314***	-0.1540***	-0.1363***	-0.1513***	-0.1292***
	(0.0390)	(0.0400)	(0.0367)	(0.0378)	(0.0352)	(0.0342)	(0.0392)	(0.0399)
Other trade measures								
Log CVD tariff factor	0.2937	0.3648	0.3194	0.4023	0.2675	0.2918	0.3041	0.3713
	(0.6446)	(0.7595)	(0.6542)	(0.7630)	(0.6412)	(0.7245)	(0.6409)	(0.7549)
Safeguard measures	-0.2358***	-0.0512	-0.2838***	-0.1034	-0.2241**	-0.0185	-0.2550***	-0.0630
	(0.0698)	(0.0703)	(0.0806)	(0.0787)	(0.1036)	(0.1108)	(0.0774)	(0.0778)
Log UN Trains tariff factor (for exports)[a]	-0.0125	-0.0236	0.0011	-0.0088	-0.0128	-0.0244	-0.0150	-0.0251
	(0.0249)	(0.0308)	(0.0240)	(0.0278)	(0.0252)	(0.0311)	(0.0256)	(0.0314)
Log UN Trains tariff factor (for imports)[b]	-0.0016	-0.0114	-0.0042	-0.0141	-0.0001	-0.0073	-0.0008	-0.0109
	(0.0136)	(0.0156)	(0.0152)	(0.0158)	(0.0112)	(0.0110)	(0.0141)	(0.0160)
Firm level controls								
Log capital/sales ratio	0.0180	-0.0373**	0.0194*	-0.0357**	0.0180	-0.0373**	0.0181	-0.0372**
	(0.0114)	(0.0179)	(0.0112)	(0.0177)	(0.0115)	(0.0179)	(0.0115)	(0.0180)
Log labour costs/sales ratio	0.0186	0.0356	0.0168	0.0336	0.0188	0.0361	0.0187	0.0356
	(0.0310)	(0.0527)	(0.0300)	(0.0531)	(0.0311)	(0.0523)	(0.0311)	(0.0527)
Industry and other controls								
Import penetration	-0.0038	0.0076	-0.0029	0.0086	-0.0038	0.0076	-0.0037	0.0077
	(0.0057)	(0.0075)	(0.0056)	(0.0075)	(0.0057)	(0.0075)	(0.0056)	(0.0075)
Export intensity	0.0260	0.0062	0.0301	0.0106	0.0257	0.0056	0.0243	0.0052
	(0.0455)	(0.0534)	(0.0466)	(0.0559)	(0.0468)	(0.0550)	(0.0438)	(0.0529)
Log number of plants	-0.0162	-0.0216	-0.0167	-0.0221	-0.0166	-0.0225	-0.0156	-0.0212
	(0.0211)	(0.0238)	(0.0218)	(0.0256)	(0.0203)	(0.0238)	(0.0213)	(0.0240)
Log industry observable markup[c]	0.0083	0.0148	-0.0199	-0.0158	0.0081	0.0143	0.0163	0.0198
	(0.0771)	(0.0796)	(0.0719)	(0.0772)	(0.0765)	(0.0783)	(0.0788)	(0.0797)
Industry GDP growth rate	0.0010	0.0144	0.0059	0.0197	0.0012	0.0151	-0.0004	0.0135
	(0.0221)	(0.0229)	(0.0212)	(0.0227)	(0.0218)	(0.0228)	(0.0213)	(0.0223)
Regional manufacturing GDP growth rate	0.0007	0.0377	0.0031	0.0404	0.0003	0.0368	0.0010	0.0379
	(0.0196)	(0.0377)	(0.0199)	(0.0375)	(0.0188)	(0.0380)	(0.0196)	(0.0378)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,536	13,536	13,536	13,536	13,536	13,536	13,536	13,536
Number of firms	3336	3336	3336	3336	3336	3336	3336	3336
Number of industries	39	39	39	39	39	39	39	39

Notes: Standard errors in parentheses clustered at the industry level. ***/**/* denotes statistically different from zero at 1/5/10% levels respectively. Instrumental variables estimations in first difference. Endogenous regressors: log capital/sales ratio, log labour costs/sales ratio. Excluded instruments: two-period lags of endogenous variables. All trade measures are weighted by the share of exports/imports on total exports/imports of the goods produced by the sector using values lagged 2 to 4 periods.
[a] Tariffs imposed by export destinations against South Korea. [b] Tariffs imposed by South Korea. [c] See footnote 43 in main text.

Table 5: Effects of Antidumping duties on firms' average markups, instrumental variables estimations.

	IV industry controls[a]				IV targeted AD and CVD[b]			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable:	$log(\hat{\mu}_{LP})$	$log(\hat{\mu}_{ACF})$	$log(\hat{\mu}_{LP})$	$log(\hat{\mu}_{ACF})$	$log(\hat{\mu}_{LP})$	$log(\hat{\mu}_{ACF})$	$log(\hat{\mu}_{LP})$	$log(\hat{\mu}_{ACF})$
AD against South Korea								
Log ADD tariff factor	0.1072*	0.0803			0.3641*	0.2867		
	(0.0645)	(0.0589)			(0.1938)	(0.2122)		
Log preliminary ADD tariff factor			0.0862	0.0541			0.3380	0.3174*
			(0.0640)	(0.0594)			(0.2196)	(0.1707)
Log final ADD tariff factor			0.1125*	0.0924*			0.4237**	0.3236**
			(0.0574)	(0.0504)			(0.2094)	(0.1544)
Other AD measures	-0.1978	0.3937	-0.1031	0.3963	11.7320*	13.8673*	12.7225*	13.7442**
	(1.9726)	(1.7433)	(1.7845)	(1.6231)	(6.6284)	(7.9952)	(7.0816)	(5.5132)
AD initiations	-0.2747	-0.4187	-0.1216	-0.2120	0.1719	-0.6569	0.6203	-0.3211
	(0.3175)	(0.3025)	(0.3256)	(0.2665)	(0.5885)	(0.6519)	(0.8820)	(0.8946)
AD imposed by South Korea								
Log ADD tariff factor	0.0303	0.0478	0.0351	0.0472				
	(0.1243)	(0.1300)	(0.1196)	(0.1255)				
Other AD measures	-1.3969	-0.3195	-1.2077	-0.0855				
	(1.3796)	(1.5084)	(1.1511)	(1.2892)				
AD initiations	0.3482	0.4271	0.2240	0.2088				
	(1.2667)	(1.0134)	(1.1522)	(1.0277)				
Other trade measures								
Log CVD tariff factor	-1.1585	-0.0067	-1.0416	0.1126	-2.2923	-2.7910	-2.9642	-3.4849**
	(1.6759)	(1.6144)	(1.5387)	(1.5081)	(2.1359)	(2.4624)	(1.9510)	(1.6081)
Safeguard measures	-0.4601**	-0.2414	-0.4592**	-0.2598	-1.1165**	-0.8323	-1.2795**	-0.6098
	(0.2242)	(0.2149)	(0.1924)	(0.1722)	(0.4921)	(0.6353)	(0.5633)	(0.5051)
Log UN Trains tariff factor (for exports)[c]	-0.0579	-0.0417	-0.0479	-0.0247	0.0513	0.0352	0.0138	-0.0136
	(0.0856)	(0.0920)	(0.0891)	(0.0912)	(0.1011)	(0.1222)	(0.1241)	(0.0929)
Log UN Trains tariff factor (for imports)[d]	0.1291	0.0339	0.1170	0.0241	0.2304*	0.2250	0.2651**	0.1989**
	(0.1429)	(0.1311)	(0.1278)	(0.1150)	(0.1369)	(0.1728)	(0.1300)	(0.0877)
Firm level controls								
Log capital/sales ratio	0.0068	-0.0421**	0.0086	-0.0404**	0.0358	-0.0299	0.0394	-0.0318
	(0.0145)	(0.0202)	(0.0133)	(0.0195)	(0.0276)	(0.0388)	(0.0311)	(0.0401)
Log labour costs/sales ratio	0.0362	0.0621	0.0295	0.0552	-0.0044	0.0315	-0.0122	0.0366
	(0.0362)	(0.0537)	(0.0352)	(0.0557)	(0.0364)	(0.0629)	(0.0432)	(0.0703)
Industry and other controls								
Import penetration	0.0547	0.0840	0.0589	0.0878	-0.0278	0.0770	-0.0556	0.0221
	(0.1158)	(0.1444)	(0.1129)	(0.1469)	(0.1031)	(0.1379)	(0.1183)	(0.1174)
Export intensity	-0.0692	0.0065	-0.0471	0.0427	0.2472	0.0770	0.4558	0.2106
	(0.3626)	(0.3464)	(0.3452)	(0.3365)	(0.3502)	(0.4810)	(0.4431)	(0.4937)
Log number of plants	-0.0251	-0.0793	-0.0362	-0.0906	0.0413	0.1101	-0.0172	0.0569
	(0.0866)	(0.0895)	(0.0840)	(0.0892)	(0.1242)	(0.1500)	(0.1393)	(0.1623)
Log industry observable markup[e]	0.7957	0.6879	0.6296	0.5286	0.1272	1.0714	-0.5711	-0.0837
	(0.5545)	(0.5376)	(0.5132)	(0.5080)	(0.7237)	(1.0369)	(0.8891)	(0.9329)
Industry GDP growth rate	-0.0511	-0.0614	-0.0482	-0.0559	0.1170	0.3674	0.0802	0.1224
	(0.1267)	(0.1230)	(0.1242)	(0.1227)	(0.2096)	(0.2644)	(0.1762)	(0.1522)
Regional manufacturing GDP growth rate	0.0038	0.0460	0.0051	0.0495	-0.0241	0.0555	-0.0083	0.0522
	(0.0308)	(0.0432)	(0.0289)	(0.0420)	(0.0301)	(0.0719)	(0.0350)	(0.0471)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,536	13,536	13,536	13,536	9,497	9,497	9,497	9,497
Number of firms	3336	3336	3336	3336	2346	2346	2346	2346
Number of sectors	39	39	39	39	27	27	27	27
Hansen test (p-value)	0.731	0.513	0.669	0.447	0.476	0.292	0.472	0.410

Notes: Standard errors in parentheses clustered at the industry level. ***/**/* denotes statistically different from zero at 1/5/10% levels respectively. All trade measures are weighted by share of exports/imports on total exports/imports of the goods produced by the sector using values lagged 2 to 4 periods.

[a] Instrumental variables estimations in first difference. Endogenous regressors: log capital/sales ratio, log labour costs/sales ratio, import penetration, export intensity, log number of plants, log industry observable markups, industry GDP growth rate, log UN Trains tariff factor (for imports) and variables on AD imposed by South Korea (log ADD tariff factor, other AD measures and AD initiations). Excluded instruments: two-period lags of endogenous variables, number of past AD measures against South Korea, number of past CV measures against South Korea, number of past AD measures imposed by South Korea, two-period lag of log of workers, import growth, export growth and log of UN Trains tariff factor (for exports). [b] Instrumental variables estimations in first difference. Endogenous regressors: log capital/sales ratio, log labour costs/sales ratio, import penetration, export intensity, log number of plants, log industry observable markups, industry GDP growth rate, log UN Trains tariff factor (for imports), variables on AD imposed against South Korea (log ADD tariff factor, other AD measures and AD initiations), log CVD tariff factor and Safeguard measures. Excluded instruments: two-period lags of endogenous variables, number of past AD measures against South Korea, number of past CV measures against South Korea, export growth and log of UN Trains tariff factor (for exports).

[c] Tariffs imposed by export destinations against South Korea. [d] Tariffs imposed by South Korea. [e] See footnote 43 in main text.

B Appendix: Data

B.1 Data used in the analysis on export unit values

This section presents a detailed description of the data and variables used in the analysis on export unit values presented in section 4. The data used in the firm-level analysis is presented in section B.2 of this appendix.

F.o.b. unit values. Export unit values are calculated using UN Comtrade data for South Korea on export values and quantities ranging from 1994 to 2009, as follows:

$$UV_{jdt} = \frac{EV_{jdt}}{X_{jdt}} \tag{B.1}$$

where UV_{jdt} is the unit value of South Korean exports of product j to destination d in year t, EV_{jdt} is the f.o.b. value of exports and X_{jdt} is their quantity. Products are defined at 6-digit HS, which is the maximum level of disaggregation available in UN Comtrade and comparable across countries.

The period of analysis covers several revisions of the HS classification. As table B.1 shows, four different versions of HS are used in Comtrade to report South Korean export data between 1994 and 2009. In order to construct continuous series for the entire period, the 2007 HS classification was taken as reference, matching other versions with it. The reason for choosing this particular HS version is that the concordance table used to match trade and industry and firm-level data, as discussed below, is only available for HS 2007.

Table B.1: HS versions reported in UN Comtrade for South Korean export data.

Years of export data	1994-1995	1996-2001	2002-2006	2007-2009
HS version	HS 1992	HS 1996	HS 2002	HS 2007

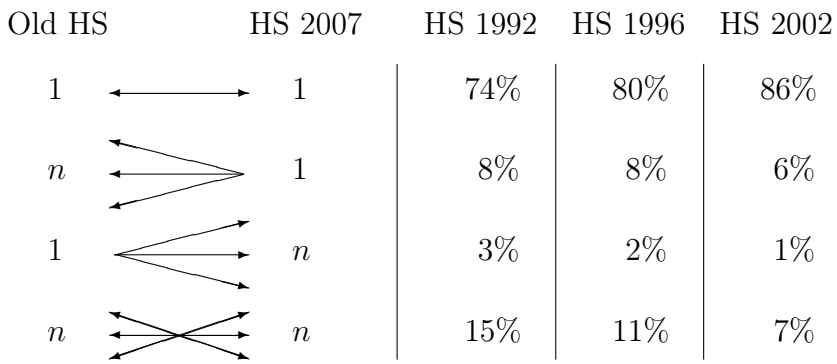
Concordance tables between different HS versions were obtained from the UN Statistical division. A problem arises due to the fact that not all codes match one to one across different versions. As illustrated in figure B.1, codes may also match n to one (meaning that several old HS codes match into a unique HS 2007 code), one to n (one HS code was split into several codes in later HS versions), and n to n. To get a grasp of the problem the figure also includes the number of codes falling in each case for the three HS versions being matched into HS 2007.[46]

Fortunately, the vast majority of trade codes present a one-to-one match across HS versions, allowing the construction of continuous series. In the second case, where several HS codes of an old version match into a single HS 2007 code, continuous series were constructed by summing up export and quantity values of the original code lines.[47] A more serious problem is presented by the last two cases where a given old HS code matches into several HS 2007 codes. For these trade lines, the construction of continuous series is not feasible since it is not possible to split exported values and quantities between the different new codes.

[46]It should be pointed out that these numbers included all codes reported in the concordance tables and not just those considered in the study.

[47]This summation was performed after adjusting the data for inconsistencies in the units of quantity reported as described later in this appendix.

Figure B.1: Concordance accross HS versions



Unit value series were constructed for codes that presented one to one or n to one concordances between HS 2007 and both HS 1996 and HS 2002, therefore allowing the construction of continuous series from 1996 to 2009. Given that HS 1992 only concerned data for 1994 and 1995, I kept codes that could not be matched to this HS version and treated those years as missing values for those particular products.

Another important issue regarding the construction of unit values is the quality of the information on quantities reported in UN Comtrade. The dataset provides information on two variables that can potentially be used as measures of quantity: trade quantity and net weight in kilograms. A priori, one could argue that the first is a better measure of quantity since it reflects the units relevant for the specific product (for example, a pair of trousers), while weight could vary from one unit to the other (the weight of a pair of trousers may vary according to fabric or size). However, this measure presents at least two important limitations. Firstly, it is missing for some observations while weight in kilograms is almost always reported, and secondly, the units in which quantities are reported are not always constant across years and trading partners for a given HS code.

To check whether this is an important issue for our purposes, table B.2 shows the disaggregation of South Korean export data by unit of quantity reported. The vast majority of observations, 72.6%, report as quantity the weight in kilograms of exports, and therefore, the two variables related to quantity are identical. Additionally, apart from "number of items" which is used in 16.7% of the observations, the use of other measures of quantity is marginal.

The table also shows that almost 10% of observations do not report any unit of quantity. For these cases, I simply used the information on weight in kilograms. The same was done for observations that reported zero quantities (less than 1%) but positive export values.

Regarding the second issue mentioned above, 68.44% of the data points report systematically the same unit of quantity across years and trading partners within the same HS 2007. For the remaining, I used instead the weight in kilograms as measure of quantity.[48] After these adjustments, and summing up values and quantities by HS 2007 for each partner and year, I was able to retrieve information on exported values and quantities for 99.62% of all observations for which concordance across HS versions was possible.

[48]Note that these numbers are not only affected by inconsistencies contained in the original dataset, but also the substitution of quantities by weight in kilograms for observations with zero or not reported quantities may have affected the continuity of a given measure of quantity.

Table B.2: Units reported in UN Comtrade for South Korean export data.

Unit	No. of observations	
Weight in kilograms	571,942	(72.6%)
Number of items	131,612	(16.7%)
Volume in litres	3,890	(0.5%)
Number of pairs	2,531	(0.3%)
Area in square metres	2,016	(0.3%)
Weight in carats	197	(0.0%)
Length in metres	175	(0.0%)
Volume in cubic meters	48	(0.0%)
Number of packages	15	(0.0%)
No Quantity	75,619	(9.6%)
Total	788,045	(100%)

Notes: The numbers reported correspond to all South Korean export data contained in UN Comtrade for the years 1994 to 2009 for manufacturing products for which concordance across HS versions was possible.

Antidumping filings and measures. Information on AD cases comes from the World Bank's Temporary Trade Barriers Dataset (TBBD) ranging from 1992 to 2009. In order to verify the completeness of this dataset, the information contained in it was compared to data on AD notifications from the WTO.[49] Table B.3 shows the number of AD cases and measures against South Korean exporters by imposing country from these two sources. The table covers the period 1995 to 2009 since WTO notifications are only available from 1995 onwards. The table does not show any dramatic differences between the two sources, which is reassuring in what concerns the completeness of the TBBD.

AD cases were matched to trade data on the basis of the HS codes reported in TBBD. However, a shortcoming of these data is that cases do not indicate the version of HS corresponding to the reported codes. Since not all countries introduce changes in HS at the same time, simply assuming that the latest version of HS is used according to the year of initiation is not completely satisfactory.

Therefore, I identify the HS version by comparing the reported codes with the HS concordance tables. I first compared the codes reported in the case to the latest HS version according to year of initiation. If no match was found, then I compared it to the HS version just before that. If still no match was found, I then compared it to the one just after.[50] Additionally, some cases did not include information on HS codes. For these cases, I looked for corresponding HS codes on the basis of the product description given in TTBD.

[49]Since the Uruguay Round reforms to GATT/WTO rules of AD, member countries are obliged to report all AD initiations and measures to the WTO in semi-annual reports.

[50]This is because some cases may report HS codes introduced later in the investigation process or when measures are imposed or revised.

Table B.3: Comparison Antidumping cases against South Korea reported by WTO and World Bank's TTBD, 1995 - 2009.

	Initiations		Measures			Initiations		Measures	
Imposing country	WTO	TTBD	WTO	TTBD	Imposing country	WTO	TTBD	WTO	TTBD
India	45	43	34	36	Colombia	7	3	0	0
China[a]	31	32	25	26	Thailand	5	5	3	3
United States	29	29	14	13	Brazil	5	5	2	2
European Union	28	28	12	10	Chinese Taipei[a]	4	6	3	3
Australia	21	20	11	10	Egypt	4	4	4	4
South Africa	15	13	16	13	Chile	3	3	0	0
Indonesia	11	12	3	5	Mexico	2	2	1	1
Argentina	11	11	10	7	Philippines	2	2	1	1
Canada	8	8	5	5	Japan	1	1	1	1
Malaysia	7	7	5	5	Ukraine[a]	1	1	1	1
Pakistan	7	7	3	6	Israel	1	1	0	0
New Zealand	7	7	3	3	Peru	1	1	0	0
Turkey	7	6	7	6	Venezuela	1	1	0	0

Notes: [a] These countries were not members of the WTO until 2001 (China), 2002 (Chinese Taipei) and 2008 (Ukraine). However, they appear in WTO notifications as early as 1997 (Chinese Taipei), 1998 (China) and 2001 (Ukraine).

Using data on AD cases thus obtained, I constructed the following variables at the product (6-digit HS) and destination level:

- *AD ad valorem duites* (ADD_{jdt}): AD ad valorem duties against South Korean exports of product j imposed by country d in place in year t. A duty is considered to be in place from the year of imposition up to the year before revocation. The level of ADD considered correspond to the "all-other-firms" duties as reported in TTBD. In the basic specification they include both preliminary and final duties. They are separated between preliminary and final duties in a robustness check.

- *Other AD measures*$_{jdt}$: Dummy equals one if AD measures of a type other than ad valorem duties are in place in year t and country d against South Korean exports of product j. They are considered to be in place from the year of imposition up to the year before revocation.

- *AD initiations*$_{jdt}$: Dummy equals one if an AD investigation was initiated in year t by country d involving South Korean exports of product j.

- *Average effect (of ADD)*: Dummy equals one if ADD are in place, i.e. if $ADD_{jdt} > 0$.

- *Number of past AD measures*$_{jdt}$: The number of final AD measures imposed by country d against South Korea affecting product j between 1994 and $t-1$.

Other contingent trade measures. Information on countervailing (CV) cases and safeguards was also obtained from TTBD. A similar procedure as the one just described was performed to match cases to trade data. It should be noted that only the European Union, the United States, Japan and South Africa initiated CV investigation against South Korea in the period of analysis. Also, only the first three imposed measures and all of these were in the form of ad valorem duties. The following variables were constructed at product/destination level:

- *Countervailing ad valorem duties* (CVD_{jst}): CV ad valorem duties against South Korean exports of product j imposed by country d in place in year t. A duty is considered to be in place from the year of imposition up to the year before revocation. The level of CVD considered is the "all-others" duties as reported in TTBD. It includes both preliminary and final duties.

- *CV initiations*$_{jdt}$: Dummy equals one if an CV investigation was initiated in year t by country d involving South Korean exports of product j.

- *Number of past CV measures*$_{jdt}$: The number of final CVD measures imposed by country d against South Korea affecting product j between 1994 and $t-1$.

- *Safeguard measures*$_{jdt}$: Dummy equals one if safeguard measures are in place in year t and country d involving product j.

Other control variables.

- *UN Trains ad valorem tariffs*$_{jdt}$: It is the level of ad valorem duties normally faced by South Korean exports of product j to country d applicable in time t, as reported by UN Trains. The information was gathered from the World Integrated Trade Solution (WITS) database, which reports information on world tariffs at the same level of disaggregation as UN Comtrade data, i.e. by importer, exporter and product at 6-digit HS. Since the objective of this variable is to consider the level of protection normally in place, I use the effective applied tariff as reported in WITS. If this was missing, I took information on preferential tariffs. If this also was not available (presumably because there is no preferential duty in place), I considered the MFN tariff, and in case this was also not reported, the bound rate. As with UN Comtrade data, it was necessary to transform the reported data into HS 2007 using the procedure described above. For the case where several older versions of HS mapped into one HS 2007 code, I constructed trade-weighted tariffs using the information on trade reported by UN Trains with each duty line.

- *Export growth rate*$_{jdt}$: This is calculated as the first difference of the logarithms of f.o.b. export values of product j to country d from South Korea. It is constructed using the same export data employed to construct unit values.

- *Share of South Korea in destination's imports*$_{\tilde{j}dt}$: Using data on destinations' imports coming from UN Comtrade, it is calculated as the ratio of the value of imports sourced from South Korea on all imports of the sector $\tilde{j}$ (2-digit HS) in country d.

- *Distance measure*$_{d}$: Distance between South Korea and country d coming from Centre d'Études prospectives et d'informations internationals (CEPII). This dataset provides four measures of distance between countries. However, their correlation is of a magnitude of around 0.99 for any given pair of measures, and therefore, the choice among them is not critical for our purposes. For the case of this particular study, I used the distance weighted by agglomerations' population (*distw*).

- *Destination's GDP*$_{dt}$ *and GDP per capita*$_{dt}$: GDP and GDP per capita of country d in constant 2000 US dollars from World Bank national accounts data.

- *Real exchange rate*$_{dt}$: Real effective exchange rate index (2005 = 100) for country d from the International Monetary Fund's International Financial Statistics.

- *Elasticity of substitution*$_j$: Elasticity of product substitution across varieties calculated by Broda and Weinstein (2006), based on the CES demand function where a variety is defined as a source-product pair. They estimate the elasticity of substitution using US import data. Assuming that the degree of product differentiation is an intrinsic characteristic of the product and not specific of a given market, the use of estimates for the United States is suitable to proxy the degree of product differentiation in South Korean export markets. Broda and Weinstein report their estimates at the 10-digit level of the 1996 version of HS. I matched these with the corresponding 2007 6-digit HS code using the concordances table from the UN Statistics Division mentioned above. I then proxied the elasticity of substitution of a given 6-digit HS by the simple average of the elasticities reported for the 10-digit codes mapping into it.

Summer statistics of all variables used in the analysis on unit values are presented in table B.4.

Table B.4: Descriptive statistics of variables used in the analysis on export unit values

Variable	Mean	Median	St. dev.	Min.	Max.	No. obs.
Log f.o.b. unit values	1.3464	1.2438	1.302591	-4.0764	9.8846	30148
Log ADD tariff factor	0.0062	0.0000	0.0439126	0.0000	1.0332	30148
Log ADD tariff factor squared	0.0020	0.0000	0.0222328	0.0000	1.0675	30148
Log preliminary ADD tariff factor	0.0006	0.0000	0.0135752	0.0000	0.8671	30148
Log final ADD tariff factor	0.0056	0.0000	0.0418405	0.0000	1.0332	30148
Other AD measures	0.0038	0.0000	0.0616449	0.0000	1.0000	30148
AD initiations	0.0092	0.0000	0.0954143	0.0000	1.0000	30148
Average effect	0.0275	0.0000	0.163627	0.0000	1.0000	30148
Number of past AD measures	0.0376	0.0000	0.1901844	0.0000	1.0000	30148
Log CVD tariff factor	0.0001	0.0000	0.0020144	0.0000	0.0583	30148
CV initiations	0.0008	0.0000	0.0287851	0.0000	1.0000	30148
Number of past CV measures	0.0015	0.0000	0.0386064	0.0000	1.0000	30148
Safeguard measures	0.0022	0.0000	0.0467384	0.0000	1.0000	30148
Log UN Trains tariff factor	0.0675	0.0488	0.0748314	0.0000	1.0116	30148
Growth rate of exports (lagged)	0.0923	0.0684	1.189085	-11.3548	11.1680	30148
Share of S. Korea in destination's imports	0.0712	0.0433	0.0806146	0.0000	0.9918	30148
Log of distance	8.8020	9.0606	0.7822745	6.8583	9.8814	30148
Log destination's GDP	12.5943	12.2784	1.810102	5.5236	16.2727	30148
Log destination's GDP per capita	2.1785	2.7323	1.330481	-2.2346	3.7408	30148
Log real effective exchange rate	4.6132	4.6082	0.11159	4.1019	5.2533	30148
Elasticity of substitution	0.0731	0.0450	0.0757795	0.0120	0.6760	29475
Log ADD t. f.*Elasticity of substitution	0.0005	0.0000	0.0040336	0.0000	0.0837	29475

B.2 Data used in the analysis on firms' markups

This section presents a description of the regressors and instruments used in the analysis on firms' markups. Details of how firm-level markups were estimated as well as the firm-level data used in that estimation are presented in appendix C.

Industry level indicators of exposure to antidumping. Firms included in Oriana are classified by the 5-digit KSIC industry where they operate. Therefore, in order to link

firms with AD cases and measures, it is necessary to construct AD indicators at the industry level. To this end, I follow Rovegno (2013) who uses detailed trade data to calculate trade-weighted indicators of AD measures and filings. For example, sector-level AD ad valorem duties are given by:

$$ADD_{st} = \sum_{k} \omega_{ks} ADD_{kst} \tag{B.2}$$

ADD_{kst} represents a given ADD k still in place in time t affecting a product of industry s. The weights ω_{ks} are calculated using information on f.o.b. export values from UN Comtrade, as follows:

$$\omega_{sk} = \frac{Exports_{jsdt_0}}{\sum_{jd} Exports_{jsdt_0}} \tag{B.3}$$

where j is a 6-digit HS product produced by industry s and affected by measure k. d is the country imposing that measure and t_0 represent the period prior to initiation of the case. In particular, I use exports from two to four years prior to initiation. In summary, duties at the industry level are computed as the trade-weighted sum of duties affecting the sector, where weights are given by the share of exports directly affected by the duty (product and country) on total exports of the sector. Therefore, this measure takes into account the relative importance of the affected product and the export destination on the sector's total exports.

The same procedure was applied to all other variables related to trade measures, including all other AD indicators, CVD and CV initiations, safeguards and UN Comtrade ad valorem duties. In the case of trade measures imposed by South Korea, instead of exports, I used the c.i.f. value of imports also obtained from UN Comtrade.

Construction of these variables requires matching data on trade and trade measures with the corresponding KSIC industries. To this end, I used a concordance table between HS version 2007 and KSIC provided by the Korean Statistical Division.

KSIC contains 461 5-digits manufacturing codes ranging from C10110 to C33999. The HS-KSIC concordance table is composed of 4821 data points corresponding to 4546 HS codes matching into 401 KSIC industries, while the remaining 60 KSIC are excluded from it.[51] Among the 4546 HS codes, 732 are lost due to matching problems between the different versions of HS described earlier in this appendix. This implies the loss of an additional 26 industries for which all HS codes present matching problems. Of the remaining 375 KSIC industries, 39 match into HS codes affected by contingent protection cases (either against or imposed by South Korea or both) and hence are considered in the firm-level analysis. In total, those KSIC codes match into 709 HS codes, of which only 22 (3%) are lost due to HS versions concordance problems. Therefore, the loss of trade codes due to changes in the HS does not seem of critical importance for the industries considered in the study.

Another issue concerning the HS-KSIC correspondence is the fact that some HS codes may match into more than one industry. However, this does not seem to be a mayor issue for the industries studied here. In fact, among the 709 HS codes matching to the

[51] This problem is quite frequent in this type of concordances, and is due to the fact that industry classifications take into account both product characteristics and production processes, while trade classifications consider only product characteristics. See Staiger and Wolak (1994), Feenstra et al. (2002) and Rovegno (2013) for a discussion on this issue for the case of US industry data.

39 industries included in the analysis, only 1 code matches into two KSIC industries. For this case, I simply considered trade under this HS code for both industries.

Following the procedure just detailed, I constructed the following variables at the 5-digit KSIC industry level:

- *AD ad valorem duites* (ADD_{st}): Export-weighted sum of AD ad valorem duties in place in year t against South Korean exporters affecting goods produced by sector s. The level of ADD considered corresponds to "all-other-firms" duties as reported in TTBD. In the basic specification, this variable includes both preliminary and final duties. These are later separated in a robustness check.

- *Other AD measures*$_{st}$: Export-weighted dummies indicating the presence of AD measures against South Korea of a type other than ad valorem duties affecting goods produced by sector s. In other words, it is the trade-weighted number of all other measures other than ad valorem duties.

- *AD initiations*$_{st}$: Export-weighted number of AD cases initiated against South Korea concerning goods produced by sector s.

- *Past AD measures*$_{st}$: Number of AD final measures imposed against South Korea between years $t-2$ and $t-6$ involving goods produced by sector s.

An identical set of variables is constructed for AD measures and filings carried out by South Korea against imports from other countries, where cases and measures are counted by product and named country (import source) and weighted using c.i.f. import values.

- *Average effect (of ADD)*: Dummy equals one if ADD are in place affecting products exported by South Korean producers in sector s, i.e. if $ADD_{st} > 0$.

Other trade measures. Using the same procedure described above for AD measures and filings, I constructed the following indicators measuring industries' exposure to trade measures other than AD:

- *CV ad valorem duites* (CVD_{st}): Export-weighted sum of CV ad valorem duties in place in year t against South Korean exporters affecting goods produced by sector s. The level of ADD considered corresponds to "all-others" duties as reported in TTBD. It includes both preliminary and final duties.

- *Past CV measures*$_{st}$: Number of CV final measures imposed against South Korea between years $t-2$ and $t-6$ involving goods produced by sector s.

- *Safeguard measures*$_{st}$: Export-weighted number of safeguard measures in place abroad affecting goods produced by sector s.

- *UN Trains ad valorem tariffs (for exports)*$_{st}$: Export-weighted sum of UN Trains ad valorem duties in place abroad affecting South Korean exports of goods produced by sector s.

- *UN Trains ad valorem tariffs (for imports)*$_{st}$: Import-weighted sum of UN Trains ad valorem duties in place in South Korea affecting imports of goods produced by sector s.

It should be pointed out that all CV measures in place in the period of analysis take the form of ad valorem duties. Also, South Korea does not use CVD, and did not impose safeguard measures or initiate investigations affecting the sectors included in the study.

Firm-level controls. Two firm-level controls are introduced in equation (9) using data from Oriana:

- *Capital/sales ratio*$_{ist}$: This variable measures capital intensity of firm i operating in sector s and it is calculated as the ratio of the book value of total fixed assets and turnover.

- *Log labour/cost ratio*$_{ist}$: This variable is a measure of firm i's labour intensity and it is calculated as the book value of cost of employees divided by turnover.

Industry and other controls. Industry level controls are calculated combing data from the Korean Statistical Department's Mining and Manufacturing Survey (MMS) and UN Comtrade. MMS data prior to 2005 is classified under KSIC Revision 8, while data post 2005 uses Revision 9. I merged data on the two periods using a concordance table provided by the Korean Statistical Department. Of the 39 sectors originally identified as affected by contingent trade measures, 33 have a one-to-one match between the two revisions of KSIC.[52] The remaining 6 industries had one-to-two, two-to-two or three-to-three concordances. In order not to lose these sectors, industry level data for them was aggregated into larger "super" sectors. MMS data expressed in won was transformed into US dollars using the average annual exchange rate obtained from South Korea's Central Bank. Series on imports and exports by industry were constructed matching UN Comtrade data with KSIC Revision 9 using an HS-KSIC concordance table provided by the Korean Statistical Division.

On the basis of these data, the following variables were calculated at the 5-digit KSIC level:

- *Import penetration*$_{st}$: Ratio of imports and total domestic sales (sales plus imports minus exports). Imports are the c.i.f. value of imports of all products matching to industry s, exports are the f.o.b. value of exports of those products, both coming from UN Comtrade, and sales are the value of shipments coming from MMS.

- *Export intensity*$_{st}$: It is the ratio of f.o.b. value of exports and the value of shipments.

- *Industry observable markups*$_{st}$: It is a transformation of the industry's price-cost margin (PCM_{st}) equals to $1/(1 - PCM_{st})$. PCM_{st} is calculated as the ratio of value added and value of shipments.

- *Industry GDP growth rate*$_{st}$: It is calculated as the growth rate of industry value added.

- *Number of workers*$_{st}$: Number of workers employed in industry s at time t as reported in MMS.

[52]Originally 45 KSIC industries were matched to AD/CV cases, of which 6 had to be dropped out because they presented either negative import penetration or export intensity greater than two.

- *Import growth*$_{st}$: Growth rate of c.i.f. value of imports matched to industry s.
- *Export growth*$_{st}$: Growth rate of f.o.b. value of exports matched to industry s.

Finally, an additional control variable is introduced measuring economic activity in the region where the firm is located:

- *Regional manufacturing GDP growth rate*$_{it}$: Growth rate of real GDP (2005 prices) of the manufacturing sector in the region where firm i is located, obtained from South Korea's Statistic Department. Regions are identified on the basis of firms' zip codes reported in Oriana.

Summary statistics of the variables used in the analysis on firms' markups are presented in table B.5.

Table B.5: Descriptive statistics of variables used in the analysis on firms'markups

Firm-level variables	Mean	Median	St. dev.	Min.	Max.	No. obs.
$Log(\hat{\mu}_{OLS})$	0.0831	0.0731	0.1048	-0.2270	1.2652	13536
$Log(\hat{\mu}_{FE})$	0.0967	0.0908	0.1279	-1.1483	1.2982	13536
$Log(\hat{\mu}_{LP})$	0.0883	0.0908	0.1240	-0.4542	1.2013	13536
$Log(\hat{\mu}_{ACF})$	0.0920	0.1048	0.2857	-6.9459	1.5702	13536
Log capital/sales ratio	-1.6620	-1.4002	1.4064	-11.6437	3.6178	13536
Log labour costs/sales ratio	-3.1840	-3.1099	0.8820	-9.1830	0.7105	13536
Trade measures in export markets	Mean	Median	St. dev.	Min.	Max.	No. obs.
Log ADD tariff factor	0.3056	0	0.5255	0	2.5449	13536
Log ADD tariff factor squared	0.3695	0	1.1048	0	6.4765	13536
Log preliminary ADD tariff factor	0.0297	0	0.2114	0	2.5445	13536
Log final ADD tariff factor	0.2766	0	0.4966	0	2.5449	13536
Other AD measures	0.0026	0	0.0053	0	0.0502	13536
AD initiations	0.0055	0	0.0315	0	0.3293	13536
Average effect	0.4286	0	0.4949	0	1	13536
Number of past AD measures	0.0400	0.0008	0.1092	0	1.0807	13536
Log CVD tariff factor	0.0033	0	0.0261	0	0.3418	13536
Number of past CV measures	0.0004	0	0.0064	0	0.1286	13536
Safeguard measures	0.0000	0	0.0001	0	0.0023	13536
Log UN Trains tariff factor (for exports)	1.8760	1.8923	0.4485	0.5975	2.8350	13536
Trade measures imposed by South Korea	Mean	Median	St. dev.	Min.	Max.	No. obs.
Log ADD tariff factor	0.1448	0	0.44509	0	2.6974	13536
Other AD measures	0.0020	0	0.01222	0	0.2498	13536
AD initiations	0.0029	0	0.02329	0	0.3490	13536
Number of past AD measures	0.0319	0	0.14868	0	1.5853	13536
Log UN Trains tariff factor (for imports)	1.9270	2.08384	0.67322	0	2.8976	13536
Other sector level and macro variables	Mean	Median	St. dev.	Min.	Max.	No. obs.
Import penetration	0.3215	0.2388	0.3859	0.0023	5.0388	13536
Export intensity	0.3953	0.3410	0.3066	0.0015	1.8409	13536
Log number of plants	5.3068	5.3423	0.9390	1.3863	7.5192	13536
Log industry observable markup	0.4572	0.4664	0.1451	0.1253	0.8785	13536
Industry GDP growth rate	0.0886	0.0741	0.2187	-0.7683	1.3584	13536
Log number of workers	8.9626	8.9347	0.7413	5.8201	11.0985	13536
Import growth	0.0700	0.0976	0.1771	-0.9414	0.7806	13536
Export growth	0.0478	0.0627	0.1853	-1.1092	0.7465	13536
Regional manufacturing GDP growth rate	0.0649	0.0539	0.0734	-0.0964	0.2261	13536

C Appendix: Estimation of production functions and markups

The trans-log production function presented in equation (6) is estimated using alternatively OLS, fixed effects (FE), Levinsohn and Petrin (2003, LP) and Ackerberg et al. (2006, ACF).[53] For LP and ACF estimations, the Wooldridge (2009) IV procedure is applied.[54] This method has several advantages with respect to two-step semi-parametric procedures. In particular, it does not require bootstrapping standard errors, allowing accounting for serial correlation and heteroskedasticity in the errors (Ornaghi and Van Beveren 2011). Moreover, it is more easily adaptable to more complex function forms such as the trans-log function presented in equation (6).

Separate production functions are estimated for each 3-digit KSIC sector provided they contain at least 1000 observations. Sectors that do not meet this requirement are summed up to the closest 3-digit sector. The proxy variable used is materials. This is preferred to the alternative proxy, investment, given that the latter implies restricting the estimation to firms reporting positive investment, with the consequent loss of data and potential selection issues.

The firm-level data used in the estimation comes from Oriana. Real variables are obtained by deflating nominal variables using price indexes obtained from the Bank of Korea. Gross output is calculated as turnover deflated by the Producer Price Index at 3 to 5 digit, depending on availability. Material inputs are obtained as cost of materials deflated by the Stage of Processing Price Index for Raw and Intermediate Materials. Labour is calculated as cost of employees deflated by the Consumer Price Index. This variable is preferred to number of employees since the quality of employment data in ORIANA is very poor. Finally, capital is calculated as total fixed assets deflated by Stage of Processing Price Index for Capital Equipment. The data was cleaned from abnormal values such as negative sales, costs or total fixed assets. Also, observations below and above the 0.01 and 99.99 percentiles of expenditure shares of capital, labour and materials within each sector were eliminated. Firms with less than two usable observations were also excluded.

Table C.1 presents descriptive statistics of the firm-level data used in the production function estimation.

Table C.1: Descriptive statistics of variables used in the production function estimation

	Mean	Median	St. dev.	Min.	Max.	No. obs.
Gross output	11076.91	2586.82	84929.78	3.19	12390519	80224
Material costs	8707.08	1961	63027.46	0.12	5854400	80224
Labour costs	412.72	134.05	1951.12	0.00	117131.10	80224
Capital	3689.06	636.64	37606.70	0.00	3798350	80224
Labour expenditure share	0.062	0.048	0.084	0.000	11.837	80224
Materials expenditure share	0.761	0.788	0.149	0.001	9.767	80224

The set of instruments used for the LP and ACF was chosen following De Loecker

[53] For an in-depth discussion of these methods see Van Beveren (2012) and Ornaghi and Van Beveren (2011).

[54] The programs used to perform production function estimations are extensions of Van Beveren (2012), Ornaghi and Van Beveren (2011) and Konings and Vanormelingen (2009).

and Warzynski (2012). For LP they include the lag of labour and its square and the interactions of current capital with the lags of labour and materials. The latter are also used in ACF. Additional higher polynomials of the lags of capital, labour and materials are also included in order to identify all coefficients. Exogeneity of instruments was tested on the basis of the Hansen test.

Table C.2: Production function and markup estimations.

Sector (KSIC code)		107	131	139	179	201	203	221	222	231	232	233
Labour expenditure share		0.0709	0.0533	0.0560	0.0581	0.0835	0.0488	0.0607	0.0517	0.0626	0.0713	0.0554
Materials expenditure share		0.7328	0.7939	0.7798	0.7773	0.6803	0.7954	0.7597	0.7922	0.7867	0.7425	0.7661
OLS	β_k	0.0071	0.0033	0.0115	0.0014	0.0446	0.0085	0.0131	0.0135	0.0159	0.0030	0.0108
	β_l	0.2128	0.1339	0.1283	0.1474	0.2363	0.1307	0.1432	0.1270	0.1303	0.1684	0.1502
	β_m	0.7845	0.8547	0.8445	0.8451	0.7311	0.8503	0.8280	0.8490	0.8366	0.8200	0.8409
	μ	1.1122	1.0940	1.0969	1.1052	1.1030	1.0800	1.1034	1.0848	1.0916	1.1340	1.1145
FE	β_k	0.0054	0.0083	0.0126	0.0079	0.0630	0.0031	0.0183	0.0175	0.0264	0.0071	0.0051
	β_l	0.1835	0.1275	0.1320	0.1242	0.2065	0.1026	0.1259	0.1160	0.0817	0.1610	0.1283
	β_m	0.8174	0.8808	0.8438	0.8640	0.7471	0.8759	0.8496	0.8724	0.9231	0.8318	0.8735
	μ	1.1602	1.1299	1.0965	1.1289	1.1543	1.1117	1.1297	1.1152	1.2047	1.1478	1.1555
LP	β_k	0.0203	0.0135	0.0157	0.0212	0.0836	0.0140	0.0135	0.0157	0.0395	0.0183	0.0113
	β_l	0.2128	0.1358	0.1274	0.1543	0.2329	0.1349	0.1445	0.1299	0.1258	0.1669	0.1627
	β_m	0.7433	0.8640	0.8260	0.8646	0.7388	0.8951	0.8420	0.8729	0.8741	0.8257	0.8102
	μ	1.0509	1.1034	1.0722	1.1306	1.0718	1.1307	1.1219	1.1158	1.1479	1.1475	1.0807
ACF	β_k	0.0229	0.0134	0.0176	0.0250	0.0826	0.0212	0.0112	0.0166	0.0288	0.0136	0.0118
	β_l	0.1146	0.0841	0.0849	0.0873	0.2583	0.1188	0.1856	0.1025	0.1000	0.1467	0.1103
	β_m	0.8061	0.8304	0.8465	0.8719	0.7045	0.8941	0.8443	0.8890	0.8859	0.8450	0.8645
	μ	1.1506	1.0832	1.1033	1.1438	1.0777	1.1220	1.1424	1.1399	1.1643	1.1540	1.1521
Observations		4681	6534	1598	1263	1422	2652	1006	7289	1463	1198	5710

Sector (KSIC code)		241	242	259	262	273	281	283	289	291	292	339
Labour expenditure share		0.0361	0.0357	0.0535	0.0664	0.0814	0.0670	0.0482	0.0871	0.0738	0.0639	0.0789
Materials expenditure share		0.8339	0.8473	0.7761	0.7726	0.7035	0.7496	0.8213	0.7065	0.7261	0.7519	0.7047
OLS	β_k	0.0120	0.0162	0.0139	0.0023	0.0047	0.0100	0.0041	0.0076	0.0125	0.0043	0.0056
	β_l	0.0960	0.0951	0.1350	0.1318	0.2306	0.1670	0.1238	0.2091	0.1762	0.1382	0.2283
	β_m	0.8850	0.8659	0.8394	0.8312	0.7546	0.8082	0.8635	0.7912	0.8003	0.8457	0.7607
	μ	1.0679	1.0394	1.0819	1.1098	1.1254	1.0959	1.0615	1.1540	1.1185	1.1439	1.1223
FE	β_k	-0.0009	0.0050	0.0182	-0.0106	0.0037	0.0135	0.0063	0.0198	0.0114	0.0151	0.0229
	β_l	0.1035	0.1100	0.1151	0.1375	0.2113	0.1537	0.1058	0.1844	0.1630	0.1212	0.1952
	β_m	0.8807	0.8123	0.8446	0.8770	0.7896	0.8287	0.9106	0.7834	0.8096	0.8648	0.7707
	μ	1.0627	0.9889	1.0675	1.1755	1.1736	1.1229	1.1195	1.1416	1.1292	1.1652	1.1208
LP	β_k	0.0128	0.0170	0.0154	0.0216	0.0319	0.0211	0.0155	0.0244	0.0157	0.0248	0.0211
	β_l	0.0942	0.0971	0.1387	0.1237	0.2335	0.1730	0.1206	0.2093	0.1791	0.1443	0.2374
	β_m	0.8957	0.7847	0.8509	0.8602	0.7548	0.7932	0.8596	0.7541	0.8077	0.8375	0.7611
	μ	1.0774	0.9405	1.1009	1.1344	1.1184	1.0864	1.0614	1.1250	1.1262	1.1361	1.0890
ACF	β_k	0.0158	0.0141	0.0268	0.0205	0.0377	0.0191	0.0174	0.0264	0.0197	0.0253	0.0288
	β_l	0.0703	0.0685	0.1780	0.1887	0.1492	0.1480	0.1245	0.1917	0.0965	0.1198	0.1967
	β_m	0.8833	0.8328	0.8365	0.8410	0.7888	0.8373	0.8693	0.7539	0.8470	0.8685	0.6326
	μ	1.0639	1.0159	1.1414	1.1443	1.1850	1.0794	1.0728	1.1102	1.0511	1.1304	1.0844
Observations		2264	2189	5775	2962	1639	10162	1374	1522	10279	2675	4567

Table C.2 presents a summary of the production function estimations by sector. It includes the average output elasticities of inputs and markups obtained using the four different estimations methods mentioned above. Markups are estimated on the basis of the output elasticity and expenditure share of materials. Markups obtained using labour resulted in unrealistic estimations, probably due to the presence of important adjustments costs in labour, which renders it an inappropriate measure. The presence of these adjustment costs also implies that labour has dynamic characteristics, and hence,

the ACF methodology, which controls for simultaneity bias in input and output choices as well as adjustment costs in labour, is particularly relevant.

Table C.3 shows the correlation between the four estimates of firms' markups, both in levels and in first differences. The first three measures - OLS, FE and LP - are highly correlated. For this reason, the results for these three series are very similar as reported in the main text. However, the correlation with the ACF markup is much lower. For this reason, in the main text results are reported for both LP and ACF, while omitting those of OLS and FE.

Table C.3: Correlation between markup estimates.

	Correlations in levels				Correlations in first differences			
	$log(\hat{\mu}_{OLS})$	$log(\hat{\mu}_{FE})$	$log(\hat{\mu}_{LP})$	$log(\hat{\mu}_{ACF})$	$log(\hat{\mu}_{OLS})$	$log(\hat{\mu}_{FE})$	$log(\hat{\mu}_{LP})$	$log(\hat{\mu}_{ACF})$
$log(\hat{\mu}_{OLS})$	1.000				1.000			
$log(\hat{\mu}_{FE})$	0.768	1.000			0.976	1.000		
$log(\hat{\mu}_{LP})$	0.868	0.714	1.000		0.943	0.929	1.000	
$log(\hat{\mu}_{ACF})$	0.317	0.327	0.356	1.000	0.071	0.111	0.081	1.000

D Appendix: Instrumental variables estimations

This appendix discusses the instrumental variables specifications used in sections 4.2 and 5.2 and presents the corresponding first stages.

D.1 Instrumental variables for unit values estimation

As explained in the main text, there is concern that the AD and CV indicators in equation (3) are endogenous. To control for this, I performed an alternative IV specification instrumenting for them (table 3). The choice of instruments is based on the idea that policy decision taken in the past are based on the set of information available to authorities at that point in time, and therefore should not be correlated to the current error term. At the same time, given that the current level of AD and CV activity is in part determined by what has happened in the previous year, these instruments should be strongly correlated to the endogenous variables and therefore, provide strong instruments. On this basis, I include as instruments the one-period lags of all endogenous regressors, as well as the number of past AD and CV measures for the particular product-destination pair. Also, the likelihood of being targeted with contingent measures must be related to evolution of South Korean exports to that particular market. Therefore, I also include as instrument the one-period lag of the growth rate of South Korean export to destination d.

The first stage estimations for the basic specification are presented in table D.1. They correspond to the IV estimation presented in column (1) of table 3. Similar results are obtained for the alternative specifications. The exogeneity of the instruments is supported by the Hansen test as reported at the bottom of table 3.

The instruments are all significant in at least one equation and present in general the expected behaviour. All five endogenous variables are highly correlated with their lags. For the case of the three variables indicating the presence of measures - ADD, other AD measures and CVD - this correlation is positive as would be expected. This reflects the fact that once imposed, measures stay in place until revoked in a review. As for the two variables measuring the presence of case initiations, they are negatively correlated with their lags. This shows that once a case has been initiated against South Korea in a product by a given trade partner, it is not likely that another will be initiated the following year within the same 6-digit HS by the same country.

Also the presence of ADD presents a positive correlation with the lag of AD initiations. This is also expected since AD investigations usually take more than one year. Therefore, when duties are imposed, usually we should observe an initiation the previous year. The inverse relationship is found between AD initiations and the lag of ADD and CVD. In fact, once duties are in place, it should be less likely to observe additional cases. A similar relationship is found between CV initiations and the lag of CVD. Also, as would be expected, CVD and CV initiations are negatively correlated with the lags of AD initiations. Less intuitive is the positive correlation between CVD and the lags of ADD and other AD measures, as well as between CV initiations and other AD measures. This suggests an overlap between AD and CV measures and cases. Also CV indicators and the number of past AD and CV measures presents a negative correlation. This is actually reflecting the fact that if measures have been imposed in the past in a particular product-destination, it is less likely that new CV cases or measures will appear for the same product-destination pair. Finally, the growth rate of exports is significant only in the equation of AD initiations presenting a positive correlation as expected.

Table D.1: First stages of unit values instrumental variables estimations.

Dependent variable:	Log ADD tariff factor (1)	Other AD measures (2)	Log AD inititions (3)	Log CVD tariff factor (4)	Log CVD initiations (5)
Lags endogenous variables:					
Log ADD tariff factor, lagged	0.8492***	-0.0060	-0.0298**	0.0023**	-0.0004
	(0.0458)	(0.0132)	(0.0130)	(0.0009)	(0.0003)
Other AD measures (dummy), lagged	0.0039	0.7676***	-0.0076	0.0003**	0.0003**
	(0.0080)	(0.0576)	(0.0051)	(0.0001)	(0.0002)
Log AD initiations (dummy), lagged	0.0859***	0.0283	-0.0130***	-0.0002**	-0.0007***
	(0.0201)	(0.0186)	(0.0046)	(0.0001)	(0.0003)
Log CVD tariff factor, lagged	-0.1009	0.0471	-0.3386***	0.6149***	-0.0874***
	(0.5710)	(0.0579)	(0.1306)	(0.1560)	(0.0300)
Log CV initiations (dummy), lagged	0.0332	-0.0277	-0.0024	0.0192	-0.0009*
	(0.0459)	(0.0180)	(0.0095)	(0.0157)	(0.0006)
Additional excluded instruments:					
Number of past AD measures	0.0047	0.0049	0.0006	-0.0003***	-0.0008***
	(0.0056)	(0.0042)	(0.0050)	(0.0001)	(0.0002)
Number of past CV measures	0.0165	-0.0088	-0.0038	0.0062**	-0.0012**
	(0.0123)	(0.0056)	(0.0045)	(0.0030)	(0.0005)
Export growth rate, lagged	0.0001	0.0000	0.0007*	0.0000	0.0001
	(0.0001)	(0.0001)	(0.0004)	(0.0000)	(0.0001)
Included instruments:					
Log UN Trains tariff factor	-0.0031*	0.0009	-0.0199	-0.0001	-0.0013
	(0.0019)	(0.0024)	(0.0126)	(0.0001)	(0.0024)
Share of South Korea in destination's imports	0.0018	0.0015	-0.0147	-0.0001	-0.0113*
	(0.0012)	(0.0031)	(0.0096)	(0.0001)	(0.0063)
Log distance measure	0.0002	-0.0002	0.0041***	0.0001**	0.0010***
	(0.0002)	(0.0002)	(0.0008)	(0.0000)	(0.0003)
Log destination's GDP per capita	-0.0003***	-0.0002	-0.0002	-0.0000**	-0.0002*
	(0.0001)	(0.0002)	(0.0006)	(0.0000)	(0.0001)
Log destination's GDP	0.0002*	-0.0000	0.0029***	0.0000**	0.0006***
	(0.0001)	(0.0001)	(0.0004)	(0.0000)	(0.0002)
Log real effective exchange rate	0.0005	-0.0079***	-0.0061	0.0001	0.0018
	(0.0012)	(0.0028)	(0.0050)	(0.0001)	(0.0012)
Observations	30,082	30,082	30,082	30,082	30,082
Number of product-year fixed effects	1,894	1,894	1,894	1,894	1,894

Notes: Standard errors clustered by product and year in parentheses. ***/**/* denotes statistically different from zero at 1/5/10% levels respectively. All estimations include product-year fixed effects. [a] Calculated at the 2-digit HS level.

D.2 Instrumental variables for markups estimation

As in the case of the analysis of unit values, there is concern of potential endogeneity of some regressors in equation (9). A first potential source of bias regards the inclusion of industry controls, which may be endogenous if some firms are large enough to affect industry conditions. To account for this, alternative IV specifications were presented in section 5.2. They first instrument for industry performance variables and trade measures imposed by South Korea, while a second specification also instrumented for trade measures targeted at South Korea.

Tables D.2 and D.3 show the first stages of the IV specifications presented in columns (1) and (2) of table 5. The exogeneity of the instruments is supported by the Hansen test reported at the bottom of table 5. The instruments first include the two-period lags of all endogenous variables. This is because in a first difference estimation, the one-period lags are correlated with the current error term, but not the two-period lag (Cameron and Trivedi 2005, p.764).

Industry controls include trade policy measures imposed by South Korea. In order to better predict these indicators, I consider additional instruments chosen on the basis of the literature on the determinants of AD (Hansen 1990; Hansen and Prusa 1996 and 1997; Baldwin and Steagall 1994; Sabry 2000; Knetter and Prusa 2003; and Blonigen and Park 2004; among others). Some of the variables put forward by this literature as determinants of AD measures, such as import penetration, are already included as regressors. As

additional instruments, I first add the number of past AD measures imposed in the sector by South Korean authorities. This accounts for the fact, frequently reported in the literature, that AD cases tend to occur repeatedly in the same sectors. I also include the number of past AD and CV measures against South Korea, since currently measure by South Korea may be the result of retaliation. I also add the log of the number of workers. This follows Moore (1992) and Hansen and Prusa (1996, 1997) who find that political factors, such as the size of the industry, affect the outcome of AD cases. Other instruments include the growth rate of imports and export. The first accounts for the fact that an increase in import competition may push firms to seek protection. The second follows earlier literature which has shown that export activity can affect AD activity, either through its impact on competition on the export market (Furusawa and Prusa 1996), or for fears of retaliation (Blonigen 2000, Blonigen and Bown 2003). Finally, I also include the average level of trade barriers faced abroad (the tariff factor of UN Trains ad valorem duties for exports in logs), as an additional measure of export market conditions. As with other instruments, I use the two-period lags of these variables.

As the tables show, with the exception of industry GDP growth, all lags of endogenous variables appear highly correlated with their first differences. Regarding the additional variables included to instrument for AD activity by South Korea, they present high correlations with the AD variables suggesting they are powerful instruments. However, the coefficients should be interpreted with caution since they relate to correlation between the first difference of the endogenous AD variables and the instruments in levels, while the literature on the determinants of AD activity relates levels to levels. However, overall they mirror the relationships usually reported when comparing levels.

The number of past AD cases by South Korea is positively correlated with changes in AD duties and other measures, which is coherent with the finding that AD activity tends to concentrate in the same sectors. Past CV activity is also positively correlated with the difference in AD duties, but negatively with changes in other measures and initiations. Past AD cases against South Korea are positively correlated with the difference in AD duties and other measures, which may be the reflection of retaliation motives. Also export intensity is negatively correlated with the presence of AD measures consistent with the retaliation threat hypothesis by Blonigen and Bown (2003). Export growth presents a positive correlation, on the other hand. Import penetration present the expected positive correlation with AD initiations. However, its coefficient is negative for the first difference in AD measures. The growth rate of imports also presents a negative coefficient for AD duties and initiations, while the coefficient is positive for other AD measures. The log of the number of workers presents the expected positive correlation with the first difference in AD initiations, but a negative correlation with the first difference of AD duties and other measures.

Table D.2: First stages of markups instrumental variables estimations, part I.

	Trade measures by South Korea				Firm controls	
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	ΔLog ADD tariff factor	ΔOther AD measures	ΔAD initiations	ΔLog UN Trains t.f.[a]	Δcapital/ sales ratio	Δlabour/ sales ratio
Lags endogenous variables:						
Log ADD (by S.Korea) tariff factor$_{t-2}$	-0.0716***	-0.0005***	0.0050***	0.0702***	0.0319**	-0.0012
	(0.0104)	(0.0001)	(0.0010)	(0.0063)	(0.0146)	(0.0120)
Other AD measures (by S.Korea)$_{t-2}$	-0.9685***	-0.2620***	-0.0777**	0.0744*	-0.0737	0.8516**
	(0.2288)	(0.0265)	(0.0310)	(0.0405)	(0.2853)	(0.3805)
AD initiations (by S.Korea)$_{t-2}$	-0.3771***	-0.0236***	-0.0454***	-0.7740***	0.0593	0.1294
	(0.0814)	(0.0058)	(0.0089)	(0.0648)	(0.1399)	(0.1037)
Log UN Trains tariff factor (for imports)$_{t-2}$[a]	0.0519***	0.0004***	-0.0021***	0.0111***	0.0147	0.0114
	(0.0056)	(0.0001)	(0.0004)	(0.0025)	(0.0111)	(0.0079)
Log capital/sales ratio$_{t-2}$	0.0025**	0.0003***	-0.0001	-0.0009	-0.0824***	-0.0029
	(0.0012)	(0.0000)	(0.0002)	(0.0010)	(0.0054)	(0.0031)
Log labour costs/sales ratio$_{t-2}$	0.0034*	-0.0000	0.0001	0.0044***	0.0009	-0.0821***
	(0.0019)	(0.0001)	(0.0003)	(0.0015)	(0.0068)	(0.0065)
Import penetration$_{t-2}$	-0.0206	-0.0025***	0.0077***	0.2359***	-0.0817*	0.0031
	(0.0127)	(0.0004)	(0.0019)	(0.0140)	(0.0447)	(0.0297)
Export intensity$_{t-2}$	-0.0182*	-0.0017***	0.0003	-0.1264***	0.0003	-0.0027
	(0.0104)	(0.0003)	(0.0011)	(0.0087)	(0.0390)	(0.0249)
Log number of plants $_{t-2}$	0.0093***	0.0008***	-0.0005	-0.0237***	-0.0181**	0.0068
	(0.0030)	(0.0001)	(0.0005)	(0.0024)	(0.0080)	(0.0056)
Log industry observable markup$_{t-2}$[b]	-0.2094***	0.0003	0.0032	0.0608***	0.1625***	0.1581***
	(0.0228)	(0.0003)	(0.0025)	(0.0097)	(0.0420)	(0.0298)
Industry GDP growth rate$_{t-2}$	-0.0095	0.0019***	-0.0006	-0.0218***	0.0055	-0.0238
	(0.0095)	(0.0003)	(0.0012)	(0.0076)	(0.0323)	(0.0210)
Additional excluded instruments:						
Past AD measures (by S.Korea)	0.0788***	0.0019*	0.0032	-0.0526***	-0.1088***	-0.0647*
	(0.0130)	(0.0010)	(0.0026)	(0.0058)	(0.0412)	(0.0340)
Past AD measures (against S.Korea)	0.0334***	0.0009***	-0.0002	0.0878***	0.0849	0.0334
	(0.0104)	(0.0002)	(0.0011)	(0.0091)	(0.0633)	(0.0400)
Past CV measures (against S.Korea)	0.3715*	-0.0239***	-0.1257***	-1.2979*	-0.2623	-0.6196
	(0.2007)	(0.0042)	(0.0140)	(0.7606)	(0.9276)	(0.8239)
Log number of workers$_{t-2}$	-0.0106***	-0.0009***	0.0028***	0.0718***	0.0128	-0.0070
	(0.0040)	(0.0001)	(0.0007)	(0.0046)	(0.0132)	(0.0085)
Import growth$_{t-2}$	-0.0231**	0.0040***	-0.0136***	0.0634***	0.0985**	0.0288
	(0.0110)	(0.0004)	(0.0013)	(0.0090)	(0.0481)	(0.0298)
Export growth$_{t-2}$	0.0215*	0.0004	0.0306***	-0.1059***	0.0134	-0.0627**
	(0.0113)	(0.0003)	(0.0028)	(0.0063)	(0.0358)	(0.0278)
Log UN Trains tariff factor (for exports)$_{t-2}$[c]	-0.0574***	0.0018***	0.0034***	0.0305***	0.0220	0.0093
	(0.0076)	(0.0002)	(0.0006)	(0.0029)	(0.0161)	(0.0120)
Included instruments:						
ΔLog ADD (against S. Korea) tariff factor	-0.0585***	0.0005***	0.0081***	-0.2984***	-0.0595*	-0.0270
	(0.0062)	(0.0001)	(0.0008)	(0.0086)	(0.0305)	(0.0197)
ΔOther AD measures (against S.Korea)	-0.0899	-0.0188***	-0.2563***	1.0618***	-1.2857	0.1115
	(0.3526)	(0.0046)	(0.0690)	(0.3645)	(1.8411)	(1.4884)
ΔAD initiations (against S.Korea)	0.7250***	-0.0016***	-0.0238***	-0.8349***	-0.1766	-0.3578***
	(0.0306)	(0.0004)	(0.0042)	(0.0594)	(0.1870)	(0.1216)
ΔLog CVD tariff factor (against S.Korea)	1.2417***	0.0028	-0.1924***	10.1669***	1.5693	0.8940
	(0.3577)	(0.0059)	(0.0219)	(1.5702)	(1.4659)	(0.8827)
ΔSafeguard measures	-0.0648*	-0.0027***	-0.0356***	0.7211***	0.3641***	0.4808***
	(0.0344)	(0.0005)	(0.0060)	(0.0688)	(0.1322)	(0.1522)
ΔLog UN Trains tariff factor (for exports)[c]	0.3564***	0.0001	0.0363***	0.3581***	0.0457	-0.0311
	(0.0325)	(0.0003)	(0.0039)	(0.0343)	(0.0560)	(0.0449)
ΔRegional manufacturing GDP growth rate	-0.0178	-0.0024**	0.0110*	0.0096	-0.1101	0.0094
	(0.0362)	(0.0009)	(0.0066)	(0.0248)	(0.0828)	(0.0642)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,536	13,536	13,536	13,536	13,536	13,536
Number of firms	3336	3336	3336	3336	3336	3336
Number of industries	39	39	39	39	39	39

Notes: Clustered standard errors in parentheses. ***/**/* denotes statistically different from zero at 1/5/10% levels respectively.

[a] Tariffs imposed by South Korea. [b] See footnote 43 in main text. [c] Tariffs imposed by export destinations against South Korea.

Table D.3: First stages of markups instrumental variables estimations, part II.

	Industry controls				
	(7)	(8)	(9)	(10)	(11)
Dependent variable:	ΔImport penetration	ΔExport intensity	ΔLog number of plants	ΔLog industry markup[b]	ΔIndustry GDP growth rate
Lags endogenous variables:					
Log ADD (by S.Korea) tariff factor$_{t-2}$	-0.0027	0.0119***	-0.0502***	0.0001	-0.1030***
	(0.0025)	(0.0013)	(0.0034)	(0.0016)	(0.0056)
Other AD measures (by S.Korea)$_{t-2}$	-0.4040***	-0.4952***	-0.3127***	-0.1899*	-0.7766***
	(0.0583)	(0.0448)	(0.0941)	(0.1099)	(0.2473)
AD initiations (by S.Korea)$_{t-2}$	-0.1623***	-0.0758***	0.4278***	-0.0420***	-0.7084***
	(0.0300)	(0.0099)	(0.0479)	(0.0122)	(0.0545)
Log UN Trains tariff factor (for imports)$_{t-2}$[a]	0.0135***	-0.0008	0.0269***	0.0047***	-0.0080**
	(0.0043)	(0.0015)	(0.0028)	(0.0009)	(0.0038)
Log capital/sales ratio$_{t-2}$	0.0013	-0.0004	0.0014*	-0.0000	0.0032***
	(0.0013)	(0.0005)	(0.0008)	(0.0002)	(0.0010)
Log labour costs/sales ratio$_{t-2}$	0.0069**	0.0028***	0.0043***	0.0015***	-0.0054***
	(0.0027)	(0.0010)	(0.0015)	(0.0004)	(0.0017)
Import penetration$_{t-2}$	-0.1698**	0.0562***	-0.0120	0.0062	0.0790**
	(0.0727)	(0.0200)	(0.0133)	(0.0043)	(0.0310)
Export intensity$_{t-2}$	0.1831***	0.0170**	-0.0622***	0.0026	-0.0171
	(0.0311)	(0.0079)	(0.0115)	(0.0029)	(0.0131)
Log number of plants $_{t-2}$	-0.0173***	-0.0185***	-0.0615***	0.0146***	0.0100***
	(0.0034)	(0.0017)	(0.0028)	(0.0007)	(0.0026)
Log industry observable markup$_{t-2}$[b]	0.1204***	0.0327***	-0.2147***	-0.0473***	-0.0035
	(0.0243)	(0.0090)	(0.0118)	(0.0049)	(0.0192)
Industry GDP growth rate$_{t-2}$	-0.0616***	0.0495***	-0.0535***	0.0092***	-0.0115
	(0.0204)	(0.0038)	(0.0068)	(0.0031)	(0.0142)
Additional excluded instruments:					
Past AD measures (by S.Korea)	0.0207***	-0.0116***	0.0607***	0.0192***	0.2766***
	(0.0062)	(0.0038)	(0.0085)	(0.0046)	(0.0148)
Past AD measures (against S.Korea)	-0.1700***	-0.0640***	0.1340***	0.0097***	-0.0678***
	(0.0157)	(0.0081)	(0.0106)	(0.0035)	(0.0147)
Past CV measures (against S.Korea)	0.2118	0.5519***	-1.5818***	-0.1165	1.3493***
	(0.1545)	(0.0720)	(0.2082)	(0.0839)	(0.1497)
Log number of workers$_{t-2}$	0.0132*	0.0218***	0.0238***	-0.0150***	-0.0205***
	(0.0068)	(0.0034)	(0.0054)	(0.0011)	(0.0052)
Import growth$_{t-2}$	0.1733***	0.0172***	0.0458***	0.0160***	-0.0771***
	(0.0291)	(0.0064)	(0.0108)	(0.0040)	(0.0152)
Export growth$_{t-2}$	0.0862***	0.0889***	0.1641***	0.0146***	-0.0873***
	(0.0090)	(0.0053)	(0.0108)	(0.0041)	(0.0135)
Log UN Trains tariff factor (for exports)$_{t-2}$[c]	-0.0184***	0.0011	0.0171***	-0.0046***	0.0002
	(0.0054)	(0.0029)	(0.0043)	(0.0012)	(0.0052)
Included instruments:					
ΔLog ADD (against S. Korea) tariff factor	-0.0505***	-0.0216***	0.0467***	-0.0262***	0.0137**
	(0.0071)	(0.0039)	(0.0060)	(0.0020)	(0.0069)
ΔOther AD measures (against S. Korea)	2.6730***	1.9519***	-1.9351***	1.5611***	-6.0666***
	(0.6994)	(0.4036)	(0.5613)	(0.1895)	(1.0034)
ΔAD initiations (against S. Korea)	-0.2665***	-0.2242***	0.1292***	0.3203***	1.3204***
	(0.0343)	(0.0183)	(0.0396)	(0.0102)	(0.0362)
ΔLog CVD tariff factor (against S. Korea)	0.0786	0.1533	1.0006***	0.0594	2.3938***
	(0.2675)	(0.1110)	(0.1581)	(0.1649)	(0.3125)
ΔSafeguard measures	0.0682***	0.0718***	-0.6169***	0.1491***	-0.1555***
	(0.0222)	(0.0127)	(0.0224)	(0.0091)	(0.0278)
ΔLog UN Trains tariff factor (for exports)[c]	-0.0871***	-0.0164	0.0626***	-0.0101	0.0968***
	(0.0186)	(0.0108)	(0.0194)	(0.0076)	(0.0213)
ΔRegional manufacturing GDP growth rate	-0.0759***	-0.0255***	0.0124	-0.0179**	-0.0443
	(0.0281)	(0.0091)	(0.0130)	(0.0077)	(0.0298)
Year dummies	Yes	Yes	Yes	Yes	Yes
Observations	13,536	13,536	13,536	13,536	13,536
Number of firms	3336	3336	3336	3336	3336
Number of industries	39	39	39	39	39

Notes: Clustered standard errors in parentheses. ***/**/* denotes statistically different from zero at 1/5/10% levels respectively.
[a] Tariffs imposed by South Korea. [b] See footnote 43 in main text. [c] Tariffs imposed by export destinations against South Korea.

The second alternative IV specification presented in the results section instrumented for AD and CV activity targeted at South Korean exports. As explained there, in order to reduce the number of endogenous variables and instruments, sectors receiving AD protection were eliminated. The instrumentation strategy is similar to what was discussed above. The set of instruments includes, first, two-period lags of endogenous variables. I also added additional instruments to better predict contingent measures against South

Korea. They include, as before, the number of past AD and CV measures against South Korea. AD activity by South Korea is not included since sectors involved have been dropped. Also, the rate of growth of exports is included, since it is more likely to be targeted with measures if exports are expanding, as well as the level of past average protection in export markets (log of UN trains ad valorem tariff factor). First stages are presented in tables D.4 and D.5.

Table D.4: First stages of markups instrumental variables estimations, instrumenting for trade measures against South Korea, part I.

	Trade measures against South Korea					Firm controls	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable:	ΔLog ADD tariff factor	ΔOther AD measures	ΔAD initiations	ΔLog CVD tariff factor	ΔSafeguard measures	Δcapital/ sales ratio	Δlabour/ sales ratio
Lags endogenous variables:							
Log ADD (against S. Korea) tariff factor$_{t-2}$	-0.3980***	0.0005***	0.0087***	-0.0009***	-0.0894***	-0.0223	-0.0401**
	(0.0129)	(0.0001)	(0.0017)	(0.0001)	(0.0049)	(0.0228)	(0.0200)
Other AD measures (against S. Korea)$_{t-2}$	1.4157***	-0.2884***	-0.1919***	0.0041	0.0580	-0.8584	-0.3056
	(0.5215)	(0.0073)	(0.0441)	(0.0042)	(0.0739)	(1.0274)	(0.8602)
AD initiations (against S. Korea)$_{t-2}$	0.9656***	0.0015***	-0.3333***	-0.0002	0.3179***	0.6367***	0.9115***
	(0.0799)	(0.0005)	(0.0185)	(0.0008)	(0.0237)	(0.2431)	(0.2274)
Log CVD (against S. Korea) tariff factor$_{t-2}$	-0.0458	0.0005	-0.0720***	0.0496***	-0.1509***	0.1360	0.1596
	(0.1163)	(0.0007)	(0.0145)	(0.0059)	(0.0377)	(0.1966)	(0.1992)
Safeguard measures$_{t-2}$	0.8077***	-0.0010***	-0.0013	-0.0049***	0.2707***	-0.1863	0.2582
	(0.0318)	(0.0003)	(0.0028)	(0.0008)	(0.0129)	(0.1221)	(0.1673)
Log capital/sales ratio$_{t-2}$	0.0036**	-0.0000	0.0003	0.0000	-0.0010***	-0.0805***	-0.0025
	(0.0016)	(0.0000)	(0.0002)	(0.0000)	(0.0003)	(0.0066)	(0.0038)
Log labour costs/sales ratio$_{t-2}$	0.0050*	0.0000	0.0004	0.0001	0.0022***	0.0014	-0.0905***
	(0.0029)	(0.0000)	(0.0003)	(0.0000)	(0.0005)	(0.0086)	(0.0081)
Log UN Trains tariff factor (for imports)$_{t-2}$[a]	-0.1363***	0.0004***	-0.0024***	-0.0016***	-0.0414***	0.0165	0.0163
	(0.0103)	(0.0000)	(0.0007)	(0.0003)	(0.0025)	(0.0195)	(0.0132)
Import penetration$_{t-2}$	-0.0033	-0.0002	0.0011	0.0016***	-0.0074	-0.0321	0.0113
	(0.0232)	(0.0006)	(0.0017)	(0.0003)	(0.0047)	(0.0599)	(0.0421)
Export intensity$_{t-2}$	0.3280***	0.0011***	0.0152***	-0.0001	0.0465***	-0.0392	-0.0289
	(0.0286)	(0.0004)	(0.0021)	(0.0002)	(0.0040)	(0.0483)	(0.0317)
Log number of plants $_{t-2}$	0.0050	-0.0001*	0.0023***	0.0007***	-0.0029***	-0.0047	-0.0049
	(0.0041)	(0.0000)	(0.0003)	(0.0001)	(0.0006)	(0.0082)	(0.0058)
Log industry observable markup$_{t-2}$[b]	-0.1066***	-0.0001	0.0080***	0.0007**	0.0088**	0.1328**	0.1748***
	(0.0176)	(0.0002)	(0.0020)	(0.0003)	(0.0040)	(0.0560)	(0.0393)
Industry GDP growth rate$_{t-2}$	0.0784***	-0.0005*	-0.0174***	0.0005***	0.0410***	0.0520	0.0344
	(0.0132)	(0.0003)	(0.0013)	(0.0001)	(0.0030)	(0.0452)	(0.0281)
Additional excluded instruments:							
Past AD measures (against S.Korea)	0.4980***	0.0015***	-0.0666***	-0.0012***	0.1229***	0.0925	0.1423**
	(0.0293)	(0.0002)	(0.0070)	(0.0004)	(0.0078)	(0.0804)	(0.0589)
Past CV measures (against S.Korea)	0.5533*	-0.0096***	0.2064***	-0.5711***	-0.0043	-1.2983*	-1.5734
	(0.3149)	(0.0021)	(0.0386)	(0.0167)	(0.0973)	(0.7723)	(1.0418)
Past AD measures (by S.Korea)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Export growth$_{t-2}$	-0.2613***	0.0033***	0.0346***	0.0007***	0.0126***	0.0539	-0.0582*
	(0.0253)	(0.0005)	(0.0017)	(0.0001)	(0.0019)	(0.0361)	(0.0303)
Log UN Trains tariff factor (for exports)$_{t-2}$[c]	-0.0804***	-0.0003**	-0.0119***	0.0003***	0.0394***	0.0340*	0.0637***
	(0.0148)	(0.0001)	(0.0014)	(0.0001)	(0.0019)	(0.0205)	(0.0152)
Included instruments:							
ΔLog UN Trains tariff factor (for exports)[c]	-0.5395***	-0.0009***	-0.0862***	0.0035***	0.1055***	0.1705**	0.1066
	(0.0762)	(0.0003)	(0.0086)	(0.0005)	(0.0051)	(0.0789)	(0.0653)
ΔRegional manufacturing GDP growth rate	0.1490***	-0.0015**	0.0095	0.0001	0.0041	0.0166	0.0491
	(0.0513)	(0.0006)	(0.0085)	(0.0004)	(0.0066)	(0.1076)	(0.0828)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,497	9,497	9,497	9,497	9,497	9,497	9,497
Number of firms	2346	2346	2346	2346	2346	2346	2346
Number of industries	27	27	27	27	27	27	27

Notes: Clustered standard errors in parentheses. ***/**/* denotes statistically different from zero at 1/5/10% levels respectively.
[a] Tariffs imposed by South Korea. [b] See footnote 43 in main text. [c] Tariffs imposed by export destinations against South Korea.

As before, we should be careful in interpreting these coefficients since they reflect the correlation between first difference regressors and instruments in levels. With the exception of export intensity and price-cost margins, all two-period lags of endogenous variables are correlated with their first differences. Past AD activity against South Korea is positively correlated with the first difference of AD duties and other measures, as would be expected, but negatively with AD initiations. It is also negatively correlated with

the difference in CV duties and positively with that of safeguards. Past CV activity is positively correlated with the first difference in AD duties and initiations, but negatively with other AD measures. Somewhat surprisingly, it is negatively correlated with the first difference in CV duties. As expected, the growth of export is positively correlated with all measures of targeted contingent measures, except with the first difference of AD duties. This is somewhat surprising, although it should be noted that export intensity presents the expected positive and significant coefficient in this equation. The lag of the log of UN Trains tariff factor present negative coefficients for all three AD indicators as expected, but positive for CV duties and initiations.

Table D.5: First stages of markups instrumental variables estimations, instrumenting for trade measures against South Korea, part II.

	Industry controls					
	(8)	(9)	(10)	(11)	(12)	(13)
Dependent variable:	ΔLog UN Trains t.f.[a]	ΔImport penetration	ΔExport intensity	ΔLog number of plants	ΔLog industry markup[b]	ΔIndustry GDP growth rate
Lags endogenous variables:						
Log ADD (against S. Korea) tariff factor$_{t-2}$	0.0137*	0.2456***	0.0941***	0.0107*	-0.0069***	-0.1006***
	(0.0082)	(0.0240)	(0.0094)	(0.0065)	(0.0016)	(0.0117)
Other AD measures (against S. Korea)$_{t-2}$	3.1830***	3.9134***	1.2544***	1.4080***	0.0306	0.1944
	(0.3400)	(1.2167)	(0.3798)	(0.3082)	(0.0739)	(0.6248)
AD initiations (against S. Korea)$_{t-2}$	-0.0820***	-0.6205***	-0.0315	-0.3309***	-0.0916***	0.7173***
	(0.0307)	(0.1247)	(0.0466)	(0.0386)	(0.0146)	(0.0864)
Log CVD (against S. Korea) tariff factor$_{t-2}$	-0.9885***	-0.4315***	-0.0375	0.3291***	-0.0501**	0.3281***
	(0.2479)	(0.0919)	(0.0297)	(0.0328)	(0.0205)	(0.0534)
Safeguard measures$_{t-2}$	0.0393	-0.5839***	-0.2054***	0.1562***	0.0353***	0.6144***
	(0.0250)	(0.0632)	(0.0232)	(0.0140)	(0.0077)	(0.0329)
Log capital/sales ratio$_{t-2}$	-0.0022**	0.0020	0.0007	0.0021**	-0.0010***	0.0039***
	(0.0011)	(0.0017)	(0.0007)	(0.0008)	(0.0003)	(0.0011)
Log labour costs/sales ratio$_{t-2}$	0.0029	0.0113***	0.0019	-0.0008	0.0021***	-0.0064***
	(0.0021)	(0.0039)	(0.0013)	(0.0016)	(0.0005)	(0.0020)
Log UN Trains tariff factor (for imports)$_{t-2}$[a]	-0.0415***	0.0869***	0.0257***	0.0252***	0.0073***	-0.0701***
	(0.0079)	(0.0104)	(0.0043)	(0.0060)	(0.0013)	(0.0060)
Import penetration$_{t-2}$	0.0888***	-0.4265***	0.0005	0.1511***	-0.0265***	0.2344***
	(0.0146)	(0.1113)	(0.0292)	(0.0187)	(0.0058)	(0.0452)
Export intensity$_{t-2}$	-0.1766***	0.2145***	-0.0055	-0.1778***	0.0317***	-0.0632***
	(0.0165)	(0.0413)	(0.0100)	(0.0113)	(0.0035)	(0.0147)
Log number of plants $_{t-2}$	0.0216***	-0.0335***	-0.0108***	-0.0278***	0.0043***	0.0043*
	(0.0035)	(0.0067)	(0.0020)	(0.0039)	(0.0007)	(0.0025)
Log industry observable markup$_{t-2}$[b]	0.0372**	0.0625*	0.0501***	-0.1500***	-0.0028	0.1410***
	(0.0162)	(0.0365)	(0.0136)	(0.0170)	(0.0048)	(0.0274)
Industry GDP growth rate$_{t-2}$	0.0574***	-0.0603***	0.0597***	-0.0720***	0.0225***	-0.0780***
	(0.0083)	(0.0211)	(0.0044)	(0.0074)	(0.0033)	(0.0154)
Additional excluded instruments:						
Past AD measures (against S.Korea)	0.0077	-0.6266***	-0.2412***	0.1114***	0.0212***	0.0813***
	(0.0140)	(0.0494)	(0.0180)	(0.0096)	(0.0054)	(0.0241)
Past CV measures (against S.Korea)	-4.2079***	0.7788***	0.3608***	-2.0514***	0.1299*	-0.0587
	(0.7033)	(0.2148)	(0.0717)	(0.1721)	(0.0690)	(0.1148)
Past AD measures (by S.Korea)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Export growth$_{t-2}$	0.0008	0.2413***	0.1344***	0.1030***	0.0575***	-0.1740***
	(0.0120)	(0.0209)	(0.0061)	(0.0100)	(0.0039)	(0.0117)
Log UN Trains tariff factor (for exports)$_{t-2}$[c]	0.1371***	0.0109	0.0274***	-0.0220***	-0.0074***	0.0230***
	(0.0094)	(0.0098)	(0.0042)	(0.0043)	(0.0012)	(0.0060)
Included instruments:						
Log UN Trains tariff factor (for exports)[c]	0.8604***	-0.0183	0.0180	-0.1989***	-0.0618***	-0.0833***
	(0.0620)	(0.0184)	(0.0141)	(0.0246)	(0.0071)	(0.0270)
Regional manufacturing GDP growth rate	-0.0794**	-0.0956**	-0.0253*	0.0550***	0.0039	0.0201
	(0.0315)	(0.0409)	(0.0132)	(0.0155)	(0.0098)	(0.0361)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,497	9,497	9,497	9,497	9,497	9,497
Number of firms	2346	2346	2346	2346	2346	2346
Number of industries	27	27	27	27	27	27

Notes: Clustered standard errors in parentheses. ***/**/* denotes statistically different from zero at 1/5/10% levels respectively.
[a] Tariffs imposed by South Korea. [b] See footnote 43 in main text. [c] Tariffs imposed by export destinations against South Korea.